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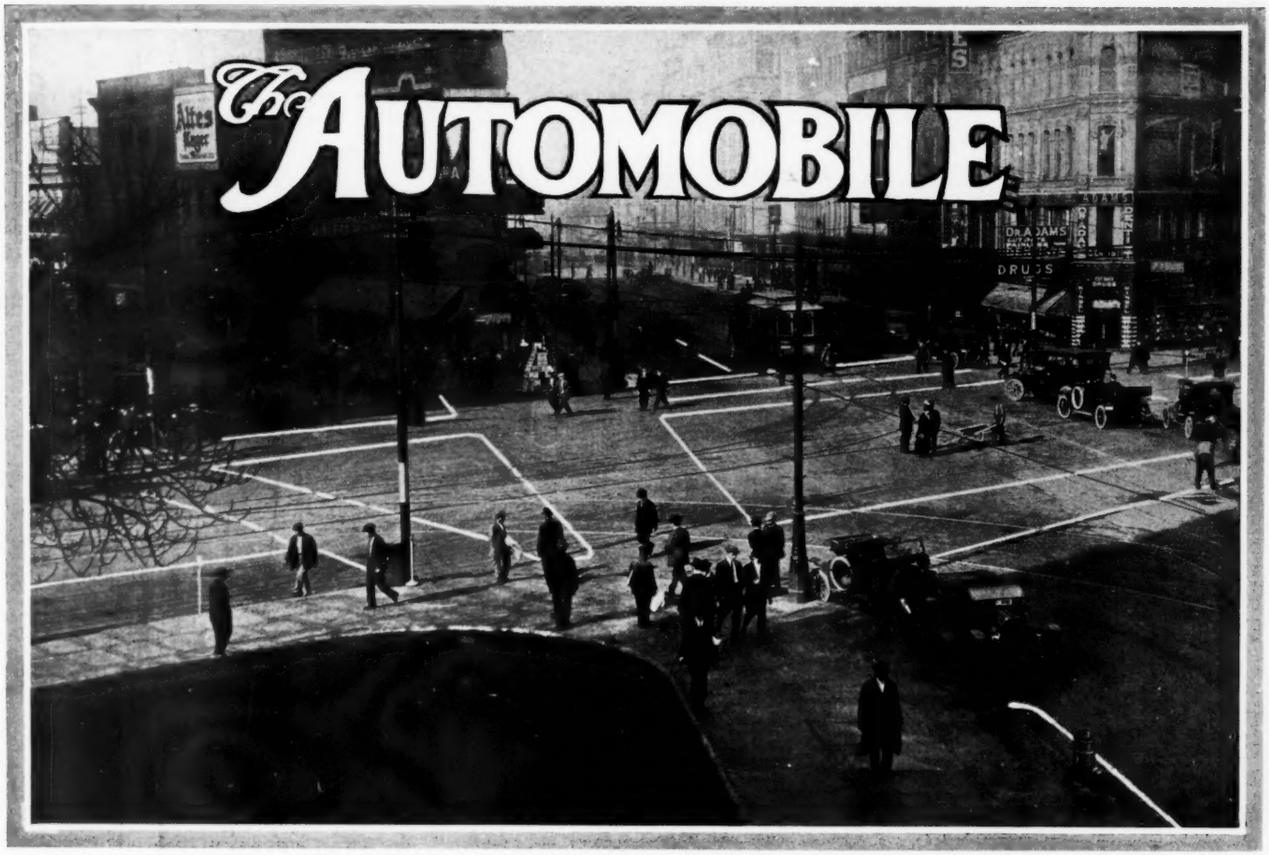


View in Detroit at Griswold, Lafayette and Michigan at 10 a. m., showing the tennis-court traffic lines

Tennis-Court Traffic in Detroit

Automobiles, Trolleys and Pedestrians Regulated by Chalk Lines

By Marc Braun

TRAFFIC runs along chalk lines in Detroit. When a man is said to "walk a chalk line," he is known to be well ordered, disciplined, regulated. Detroit's down-town streets are actually chalk-marked and automobiles, coal wagons, shoppers, messenger boys and tired business men are hop-scotching along the white boundaries from block to block in perfect order and without complaint.

The Neutral Zones

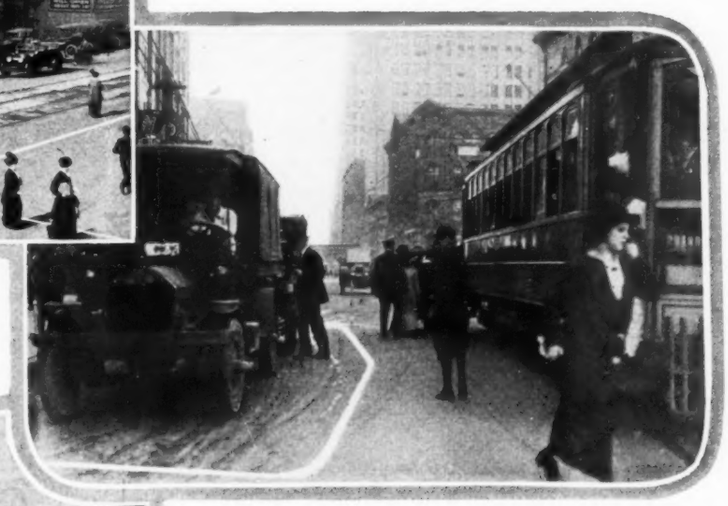
When you cross a street at a down-town corner, the lane in which you are supposed to walk from side to side is bounded by white lines on the pavement, almost duplicates of the lines marking a tennis court. When you get into the middle of a busy street to board a trolley car, there is marked out in white a safety zone for you to stand in and on the confines of which the heavy horse dray, the motor van or the bicycle must not encroach. At the fire hydrant are found the tennis-court lines declaring in silent tones the neutral zone on which you must not park your automobile, lest it interfere with fire apparatus in the event of a fire. Along the curbs in the down-town section are zones telling you where you can and where you cannot park your car. Along the curb at many places are conspicuous signs telling you to park your car "parallel to the curb" or "at an angle to the curb!"

There are more automobiles in proportion to area and population in Detroit than in any other American city. Also, there is only one main popular thoroughfare, Woodward avenue, leading into the heart of down-town Detroit. The congestion that

How the Tennis-Court Traffic

White Chalk Lines Mark Zones of Spaces for Automobiles—Prevents Jay-Walk

Pedestrian safety lane and street car safety zone on Woodward avenue and Grand River



One of the congested corners at busy times of day. Griswold, near State. Note the safety zone around trolley car

The system violated! Note signs forbidding parking of cars at this point

Above—Line-up at 1 p. m. on Griswold north from State. The car without driver in the street is a post office collecting vehicle

Left—Farmer street, on one side the library and on the other, two department stores. Naturally, this makes a very busy street. Note department store delivery cars

System Works Out in Detroit

Safety for Pedestrians and Parking System, Properly Operated, ing and Driving

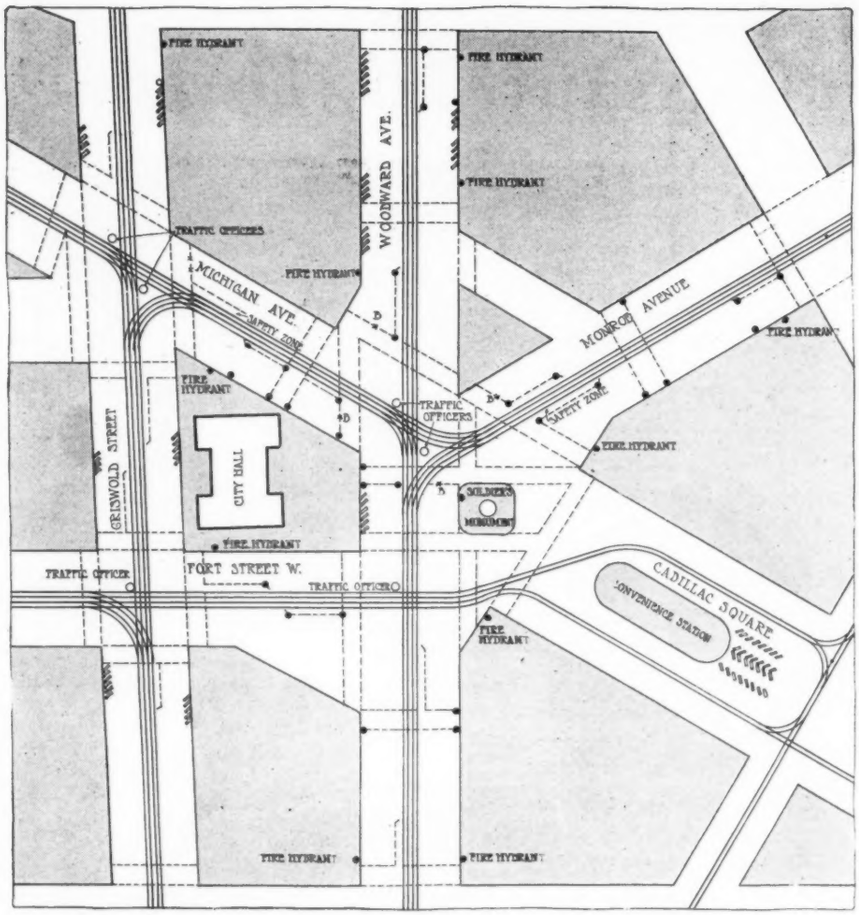
Criswold, in front of the Dime Savings Bank and the City Hall opposite at 10 a. m.

From a photograph taken at 10.30 a. m. on West Fort street, showing cars in front of banks

One of the warning posts distributed throughout the city indicating method of parking cars

Above—A view on Woodward avenue at 2 p. m., looking from State street. Note the cars parked diagonally to the curb

Right—How each fire hydrant is marked out with safety zone to insure ample space around it for the firemen to work in case of an alarm from that district



How the tennis-court system of regulating is laid out in Detroit, as exemplified by the central business district of the city. Traffic officers are indicated by rings. Black dots indicate posts supporting notice boards relating to parking of cars, etc. At the points B all automobiles and other vehicles must stop to await the traffic officer's signal to proceed. Note cars parked at the curbs. Also note crossing places and safety zones

results impelled an entirely new method of traffic government.

Tested first last June, the new system is now permanently adopted. Its approval by traffic experts probably will result in similar street markings in many other cities.

The marked lanes are supplemented by a variety of sign posts that not only are educational in relation to the new system but have the Safety First legend.

Rush-hour jams, jay driving and jay walking, and accidents at street car stopping points have been diminished by the new chalked boundaries.

The Tennis-Court Boundaries

The street-crossing lanes for pedestrians are generally 18 feet wide, the same width as that of the sidewalk, and the white lines of chalk extend from sidewalk to sidewalk.

At street car stopping places the white lines indicating the safety zones are 60 feet long or the length of one or two street cars. The line is drawn 6 feet from the car line tracks.

Along the outer white line of the pedestrian street crossing zones there are posts bearing the words: "Crosswalk—By Order" or simply the word "Walk" under a cross. At the end of the white line near the street car tracks there is generally a post bearing the words, "Safety First."

Parking Regulations

Near fire hydrants posts are generally placed either in front or on both sides of a white line and the words, "Hydrant—No Parking—By Order," are on it.

On those sides of the street where no cars must be parked or where they are to be parked only within certain space, there is generally one or several posts bearing inscriptions like these: "No Parking Allowed on this side of Michigan avenue," "Cars must not park within this space."

Near street car stopping places at street crossings automobiles and other vehicles may not be parked for a distance of 75 feet.

In front of public buildings, banks, theaters, one or more posts are generally in place on both sides of a space of 15 or 20 feet to permit people to alight from their car.

In the avenues or streets which are wide enough automobiles are parked obliquely while in most side streets along Woodward avenue they are parked parallel with the sidewalk.

On certain thoroughfares traffic is permitted only one way.

The various posts have the warnings painted in black upon white while the white safety posts have the words "Safety First" painted in red. All post warnings have the words: "By order of the Police Department," or the words, "By order" under the warning inscription.

The System's Area

The new traffic system, which at first took up only a few of the most congested business blocks in the heart of the business district, on Woodward avenue and some of the side streets, was quickly extended and now comprises a section of the city extending along Woodward avenue from Jefferson to Warren in length, and from Randolph to Shelby in width. This is an area having dimensions of fourteen blocks by four. A few other streets and sections of Woodward avenue having heavy traffic are similarly regulated.

At the present time fifty-four traffic officers are on duty daily on the streets within those blocks. Some start at 7 in the morning, some at 8, and while they work in shifts some are on duty till 8 in the evening in the business district.

Generally only one officer is at a street crossing,

but there are places where two and more men are required. For instance at Woodward and State streets four traffic men are on duty from 4.30 to 6 p. m. At this particular crossing, it was claimed by one of the traffic men, more automobiles, street cars and pedestrians cross during the hours of 4 and 6 than in any other city in the country, with the possible exception of New York.

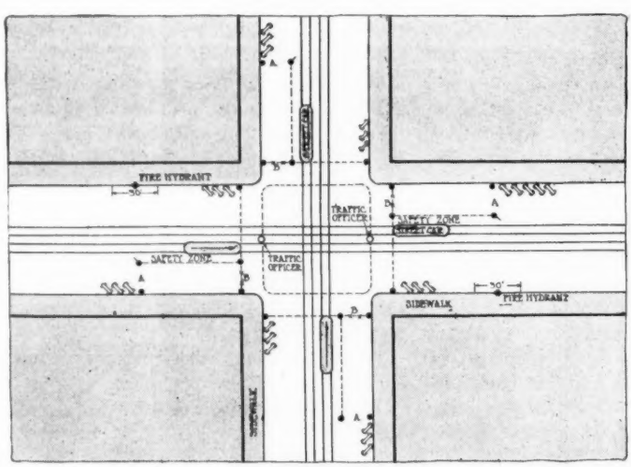
The one main thoroughfare to the business district, the theatres and the principal hotels is Woodward avenue. Practically all automobile drivers use it to come to their places of business and to drive home. Most of the side streets are rather narrow and poorly paved and have street car traffic.

Parking the Cars

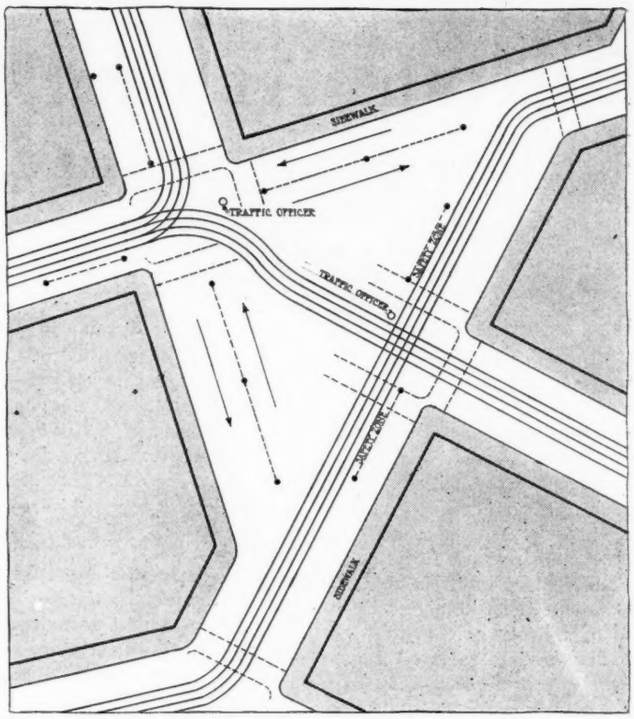
Most automobile owners or drivers leave their cars in the street in front of their building. Thus most of the streets have cars parked on both sides, sometimes parallel with the sidewalk and mostly obliquely with the sidewalk.

This oblique parking system has given excellent results as it permits about three times as many cars to remain within a city block than in the old way of having the car backed in full length against the curb of the sidewalk. To give an idea of the improvement a count was made of the number of cars actually standing along the sidewalk from Campus Martius to Grand Park Circus, on Woodward avenue, between 4 and 5 o'clock of a certain day. Within the four city blocks there were 190 cars parked, ninety-six on one side and ninety-four on the other side. These 190 cars took up a total space of 1,520 feet by being parked obliquely instead of one behind the other, in which instance the total space required would have been 2,280 feet. Thus the new way means a saving of 760 feet of space, or at the very lowest, the equal of two city blocks.

There are only twenty-one garages in the quarter-of-a-mile circle which starts from the city hall and which territory comprises 150 city blocks. Fully two-thirds of the 2,000 to 3,000 cars which are parked along the streets daily are found within less than twenty-five of these 150 city blocks. The twenty-



A typical street intersection. No parking is allowed within the space indicated between A and B on each street. Method of parking cars, safety zones, posts of traffic officers and crossings are shown as well as fire hydrant zones



How the triangular street intersections are treated in the Detroit tennis-court system of regulating traffic, showing crossing places, sidewalks and safety zones besides trolley car stopping places

one garages could accommodate 1,426 cars on a basis of fairly prompt service, which means that it would require an average of 5 minutes at least to get the car in or out. In some cases it would require fully 10 minutes.

While, figuratively speaking, the 2,000 or 3,000 cars remain on the streets from about 10 in the morning till 5 in the evening, from 40 to 50 per cent. of these cars are used from time to time during the day by their owners and thus it would not be practical, on account of loss of time, to have them in garages.

City Statistics

The total number of automobiles now operated within the 42 square miles of city territory is estimated at between 21,000 and 22,000 according to the officials of the secretary of state's department. City officials say that the city now has very near 620,000 inhabitants and thus on the basis of 21,000 cars there is one automobile per thirty Detroiters and 500 automobiles to the square mile of city land.

When the new traffic regulations were tried for the first time most of the traffic officers did not believe that the people would give much attention to the broad white chalk lines at street crossings. Neither did the officials think that the safety zones at street car stopping places would be found real safety aids.

But from the very first day it seemed that all Detroiters understood the undeniable advantages of thus being provided with safety walking spaces or lanes, and pedestrians and drivers of horse and non-horse vehicles showed a decided disposition to "be good."

British Army Truck Efficiency

Organization Is Most Complete—Facilitates Food Distribution—Some Problems

By J. M. C. Rowley
Special to THE AUTOMOBILE.

PARIS, Nov. 1—Nothing approaches in efficiency the work of the ordinary motor truck in the service of the British Army Service Corps, the most thoroughly organized army service corps in the world. The work of those trucks is wonderful and the drivers no less ask to be praised. Back of the fighting line I have seen them tearing along those fine French roads fully laden, frequently entering into the line of fire having to pass gaps when the enemy's forces are not directly opposed.

That admirable distribution of food supplies which has been a characteristic feature of the allied army is immensely facilitated by the trucks running from post to post carrying provisions which are afterwards taken to the regimental base and from there frequently to the men in the trenches by orderlies who run great risk in so doing. I was wondering whether small armored tri-cars could be used for such field distribution, and discussed the subject with a sergeant, but he was inclined to think that across field work would be too heavy for them. It would be interesting, however, he admitted, to have such a small car designed with powerful motor and heavily armored.

More Armor Needed

I met three British armored cars this morning along the high road leading into Paris. The radiators were practically unprotected. Is it absolutely essential that the radiator should be directly in front of the truck or car? A distribution of air could be made by radiators placed at the sides, so that the front of the motor could consist of a solid steel plate.

Still, the radiator danger is minimized because it is very rarely that a truck or car would come face to face with the enemy's fire. A truck's principal duty in actual warfare is to link up the line of operations. In the present campaign the line is immensely extended and exceedingly elastic. It is the automobile that renders this possible. I am firmly convinced that such a huge front between two armies of such power as those of the German and the Allies could not be kept without the automobile.

As an actual instrument of attack the motor car is not being used. It was tried by the Germans in Belgium, twenty cars charging in line, but failed. It is very rarely that sheer weight wins in a charge against skillful opponents.

No Trucks in Paris

In this city I have seen no commercial vehicles of any kind, except one—engaged in ordinary commercial work. In fact, all commercial work seems to a very large extent, to have failed. A Frenchman connected with the motor business told me the other day of what a lot of trade had been done in automobiles by Germany with Russia, the Balkan States, Belgium, South America and Italy. Especially so was this the case in regard to Russia, and, if ever there was a big field now for motor vehicles *asking* to be captured, it is in Russia.

In France and England all private cars are being utilized—for very varied purposes. As ambulances their value is great, and 500 cars are to arrive immediately in France for the British Red Cross society. They enable the wounded to arrive at the hospitals three or four times quicker than by train. Again, the cars are being used to take convalescent soldiers for a ride when they are able to go out into the open. The American Red Cross branch is exceptionally well organized in connection with automobile conveyance.

The British officers are all one in praising the work of the automobile. Perhaps its practical value is greatest as a conveyance for orders, a mechanical aide-de-camp. I have been out three times with the Red Cross to the battlefields and noticed scarcely any ruined vehicles, so conclude that they do not operate in the immediate field of action, and they are very effective in operation, suffering very little mechanical trouble.

A wounded truck driver has told me how his truck, a 3-ton, was in operation practically all day, he and his comrade serving as shifts. It was used for conveying food supplies from a base to the camps. The conveyance over fields is difficult and the truck is of practically no value. Lately, too, the roads in the field of operations have been muddy and sticky with clay and it has been difficult to operate any trucks heavier than 3 tons. That capacity is found to be most universally useful. The solid tires are wearing well, although there is great tendency to pulp up in certain parts. The wear and tear on a solid rubber tire does not seem to be at all regular, bumps seem to break off, and some I have noticed in ruined condition, although the vehicles still bump along.

How Trucks Are Used

The quick retreating and advancing movements that have been a special feature of the present campaign have been made possible *only* by the motor vehicles. Infantry can cover 30 miles during the day easily, while the cavalry can move trebly as quick. But an army has always been retarded by its baggage; it clogs the wheels of movement and hangs like a millstone round its neck. Thus, the perils of short rations and ultimate starvation were always to be expected when large bodies of men were engaged in very quick movements over a large stretch of country.

The German army is extremely quick in movement, that is movement en masse. Yet without similarly adequate methods of conveying baggage and supplies, their operations would have been futile. The motor vehicle has given both armies the additional wing which enables them to pursue or fly, as the case may be, so swiftly.

It is hard to imagine with what an extremely difficult problem a quartermaster is faced in actual warfare. It is hard enough in mimic operations. But when life depends on the skill of his arrangements, its difficulty is accentuated to the extreme.

It is not permitted by the censor to name positions, but let me illustrate this by an actual example. Take the following diagram:

ABC represent the retreating army corps of the Allies.

DEF represent the attacking army corps of the enemy.

The ABC army till now has been attacking; and has always kept its base of supply well behind the center B. The army arrived at the banks of the river,

but found the defenses very strong all along the opposite banks, so it was found necessary to retreat in the direction from which they had come, namely, that opposite to the arrow in the diagram. Accordingly the retreat commenced in a northeasterly direction, but to the northeast it was found to be impossible to proceed as it was necessary to concentrate all force with M on the further side of the river, faced by a large body of the defenders, N, subsequently the attackers. A retreated quickly to the base G, B advanced in front of base of supply attacked by E and F. D crossed the river, and swept northwards, threatening the rear of the base of the supplies by an attack on the right flank.

The commander at G had a most serious problem, and had it not been for motor vehicles it would have been impossible to save the supplies, and as a consequence the forces A and M would have been cut off, B and C perhaps effecting a retreat to the northeast. But the base G was able to move as quickly as the attacking force in flank D and sped in the rear of C, B waiting to protect the retreat. The base moved easterly along the river, C crossed and joined M and A and B took up a position of strength along the river bank. It was because they were able to move at a moment's notice their basis of supply and with equal celerity to the approach of the attackers that the army was then saved. It is when a base feeds numerous armies liable to be separated that the quartermaster finds difficulty.

Collecting the Wounded

Ford cars are much used, but chiefly as messenger carriers. Only big cars are of any use for the transportation of wounded. I saw one transport car loaded and loaded again with wounded all higgledy-piggledy, poor fellows! But taken as a whole, the arrangements for the wounded are excellent.

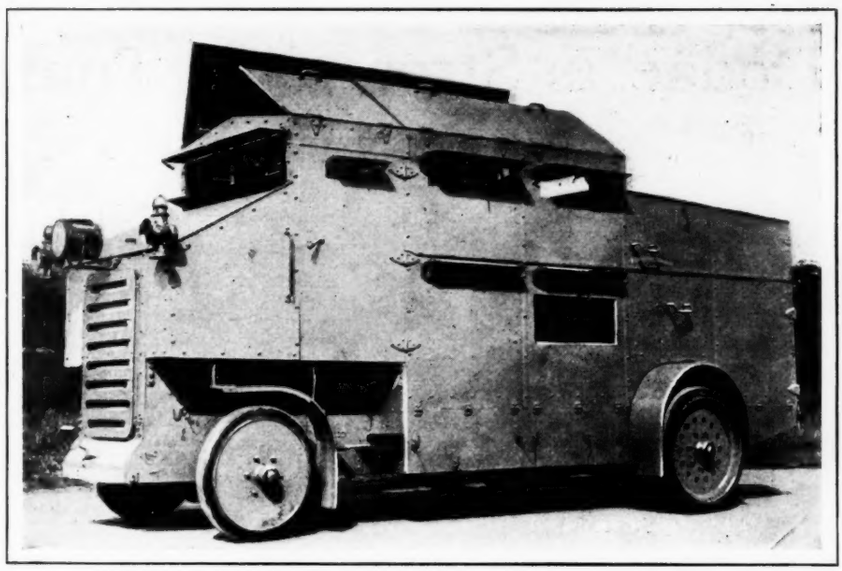
A certain number of automobiles usually arrive at a certain central position immediately in the rear of the seat of action, covering an area which is called the area of the field ambulance work. At the front of this there is a dressing station, or, rather a number of dressing stations, fed by the ambulance bearers from different points of the field. From the dressing stations the wounded are conveyed to a kind of clearing-house, where they are distributed to the general base hospitals, and it is here, of course, that the automobile is so useful. In former times it was along this route, often over a long distance, that many of the wounded succumbed, but the automobile links up the field with the base.

The front has to be cleared first. That is done in double-quick time. Now, there is little delay in sending the wounded to the base hospitals, the one place, of course, where proper aid can be given them. Many wounded seem to be arriving unwashed and with their wounds undressed, while men suffering from epidemics are frequently near to those not so afflicted.

The German advance through Belgium on to the northeast provinces of France was one of the quickest movements ever executed in military history, being of tremendous extent in line and face to face all the while with an active and sheltered enemy. What was the principal agent in the German advance? What enabled that huge arm pivoted in Luxembourg to sweep with massive vigor against northeast France and crash toward Paris? What kept the regiment of that arm united? The motor vehicle.

The German army possesses a bigger, stronger and more thoroughly organized system of motor traction and inter-communication than the allied forces, and I understand that there are many thousands of vehicles ready at a moment's notice to take the place of injured cars, although the number of the latter is comparatively slight.

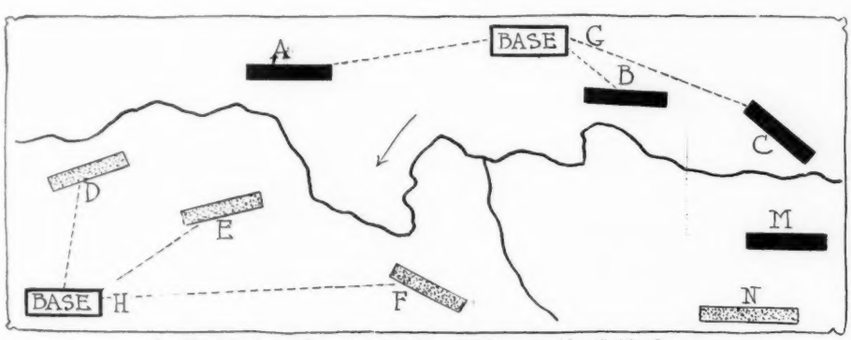
Russia has a huge fleet, but there is very little detailed news coming in from the Galician frontier, and I have not yet been able to secure any information relative to the immense work which must have been done by motor vehicles in the mobilization of the Russian army—a work, by the way, of wonderful celerity Their work will have to be suspended, however, during the coming winter as during this season the roads in this district are in many places impassable.



One of the German army's armored motor trucks which took a prominent part in the siege of Antwerp. Note the protected radiator

German Armored Cars

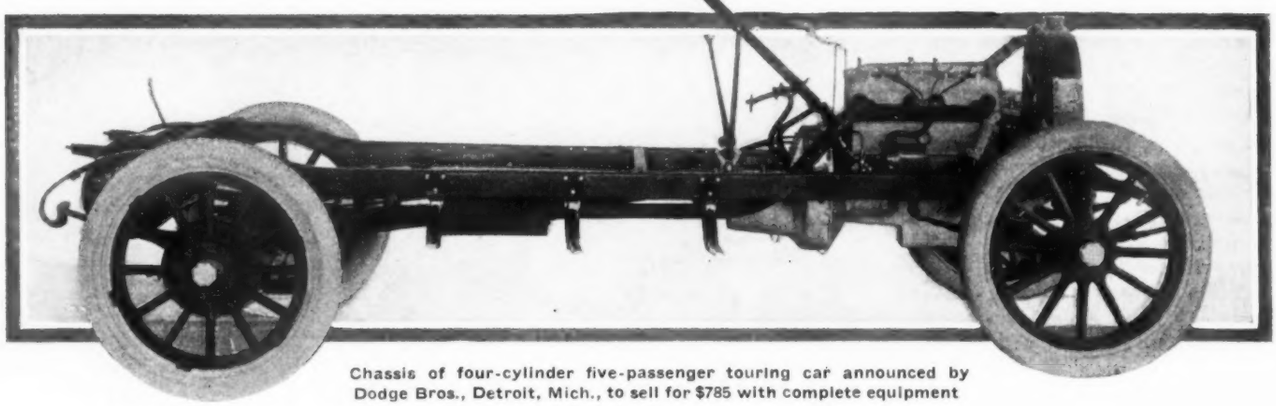
The German car for war work is much more often armored than that of the Allies. All the cars seem to have been commandeered touring cars fitted with plates of steel, protecting all the vital parts and frequently the occupants. I noticed several of these in Antwerp captured in action by the Belgians, some being those, it was said, used by the Kaiser in a mad motor charge full in the face of a pitiless fire. The machine didn't seem injured in any way and in most cases it was the driver who was shot before the car was damaged. He was supposed to be protected by a steel plate in place of the windshield, but this was ineffective protection, the side of the driver's seat being open and leaving the driver exposed to fire.



An illustration of motor truck operation on the field of war

Dodge Is Streamline Touring Car at $785

Block Four-Cylinder Motor 3 7-8 by 4 1-2—Five Passenger Body—Complete Electric System



Chassis of four-cylinder five-passenger touring car announced by Dodge Bros., Detroit, Mich., to sell for $785 with complete equipment

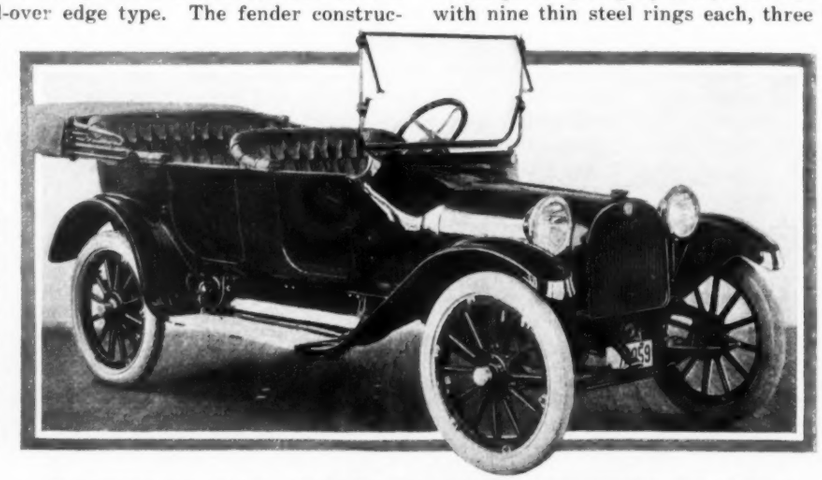
ALL the mystery about the Dodge Bros. contribution to the world of motoring has been cleared away with the announcement this week of the make-up of the car. Even the price speculation has been quieted, for it is set at $785. Furnished only in five-passenger touring form, the Dodge car is a streamline machine of sturdy mechanical construction. The specifications include a block-cast, L-head motor, 3 7-8 by 4 1-2 size; gearbox in unit with the engine; drive through a propeller shaft inclosed in a torsion tube to a floating rear axle; cone clutch; three-quarter elliptic rear springs; overslung frame; and left drive with center control.

The wheelbase is 110 inches, and tires 32 by 3 1-2 all around, the rear set being of the non-skid variety. Equipment is of note in view of its completeness, taking in such items as North East combination motor-generator set for cranking and lighting, Eisemann magneto, Jones speedometer, one-man top, rain vision and ventilating windshield to which the front of the top fastens, Willard battery, etc.

The body is a trim affair being an example of all-steel construction. Even the frame is of steel. Upholstery is of machine and hand-buffed leather. The body and bonnet are united without any disturbing lines due to the consistent slope of both cowl and hood, which is finished out with a radiator of the coped-over edge type. The fender construction is good, being of the oval molded type rounding into the splashers.

The cowl board arrangement shows that the instruments necessary in driving are placed a little to the drive side of the center. To the right of them is a small compartment with a lock which may be used for carrying gloves, etc. The instrument panel is of pressed steel.

The motor, S. A. E. rating of 24 operates with a compression pressure of 65 pounds per square inch. There is no question that this motor is amply powerful for the car, for with a ratio of stroke to bore of 1.16, it has a displacement of 212.3 cubic inches. When the car is running at about 10 miles an hour on high, the motor is turning over at 380 revolutions per minute.



New Dodge car, showing streamline five-passenger body, rounded-over edges on radiator, smooth doors, etc.

Separate Cylinder Heads

The general arrangement of the motor is of the type in which the cylinder head is a separate piece, bolting to the cylinders. The intake passages are cored through the single-opening to the carbureter on the left to the intake ports on the right, the cored passages being between cylinders Nos. 2 and 3. The exhaust manifold is a separate casting with an opening individually from each cylinder. A single long plate incloses the valve mechanisms.

On the left is mounted the motor-generator in addition to the carbureter, and the magneto and water pump are placed on the right.

The suspension of the motor is three-point.

The Reciprocating Parts

The pistons, of gray iron, and 4 3-8 inches long, are fitted with nine thin steel rings each, three to a groove. Connecting-rods attach to the pistons by 13-16 inch pins held to the pistons by set screws, the rods bearing on them with 1 3-4-inch phosphor bronze bearings. The rods are vanadium steel drop forgings of usual H-section, and measure 9 1-8 inches center to center of bearings.

The crankshaft is of the same material as the rods and rotates on three brass-backed babbitt

bearings. The rod bearings are of the same material. The crankpin diameter is 1 1-2 inches. The three main bearings are 1 5-8 inch diameter, and their lengths are 2 15-32 inches front, 2 1-4 inches center and 2 19-32 inches rear. Like the crankshaft, the camshaft is a vanadium steel drop forging and has the same number of bearings. It operates through steel timing gears housed at the front.

The valves, of 1 9-16 diameter in the clear, have vanadium steel stems and springs. Their lift is 5-16 inch.

Circulating-Splash Oiling

The oiling is by the circulating splash scheme which makes use of an eccentric pump driven by spiral gear on the crankshaft. It feeds oil through a pipe lying along the roof of the crankcase, this pipe being drilled to throw jets of oil into the troughs under the connecting rods and into pockets above the crankshaft and camshaft bearings. From these points the oil finds its way back into the oil pan where it is filtered and made ready for re-circulation.

Cooling is by a centrifugal pump driven at crankshaft speed and operating in conjunction with a six-blade pressed steel fan belt driven from the pump shaft, which is carried on an adjustable bracket to take up belt stretch. A 5-quart radiator of tubular construction with six rows of twenty vertical tubes each is the main cooling agent. The total waterjacket capacity is 2 gallons.

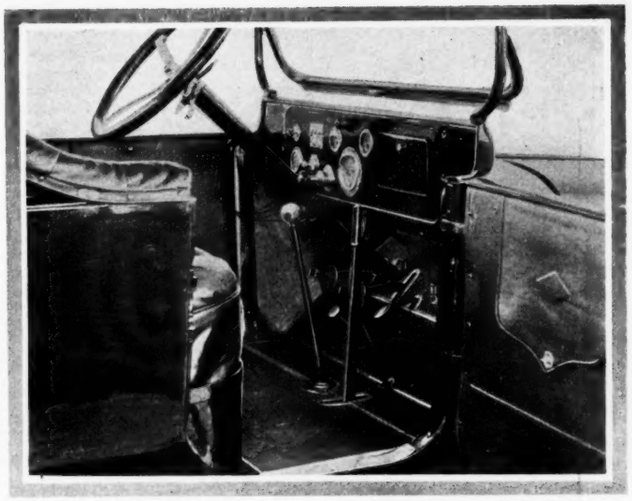
The ignition current is supplied by an Eisemann G-4 high-tension magneto of waterproof type. This is driven from the end of the pump shaft and it connects to a set of A. C. spark plugs with the firing order 1, 3, 4, 2.

Motor-Generator System

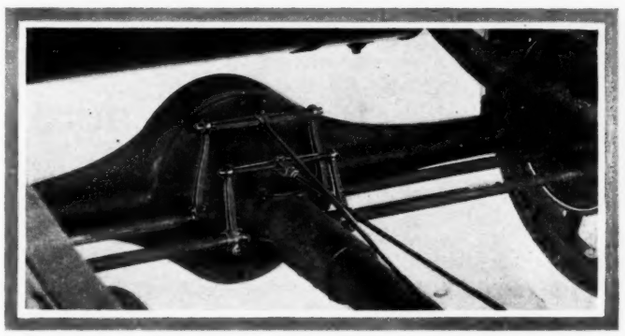
The combined motor-generator which takes care of all electrical requirements except the ignition is a North East 12-volt unit, mounted on the left forward side of the engine and driving through an inclosed silent chain from the crankshaft with a 3 to 1 reduction. It operates in the regular way either as an electric motor for starting or as a generator for charging the battery and lighting the lamps. The battery, carried under the left front seat, is a 12-volt Willard of 40 ampere-hours capacity.

The starter pedal is placed in the center of the toe board, and after switching on the ignition, it is only necessary to press this pedal to turn the crankshaft with a torque of 35 foot-pounds. After the starter pedal is released, the unit automatically becomes a generator.

Connection between motor and final drive is by a cone clutch having spring inserts under the leather facing. The cone has a mean diameter of 14 inches and the face width is 1 3-4 inch. It is inclosed within the integral extension of the gearbox which forms the flywheel housing and bolts to the crankcase.



Driver's compartment of Dodge car, showing left drive and center control and instrument board

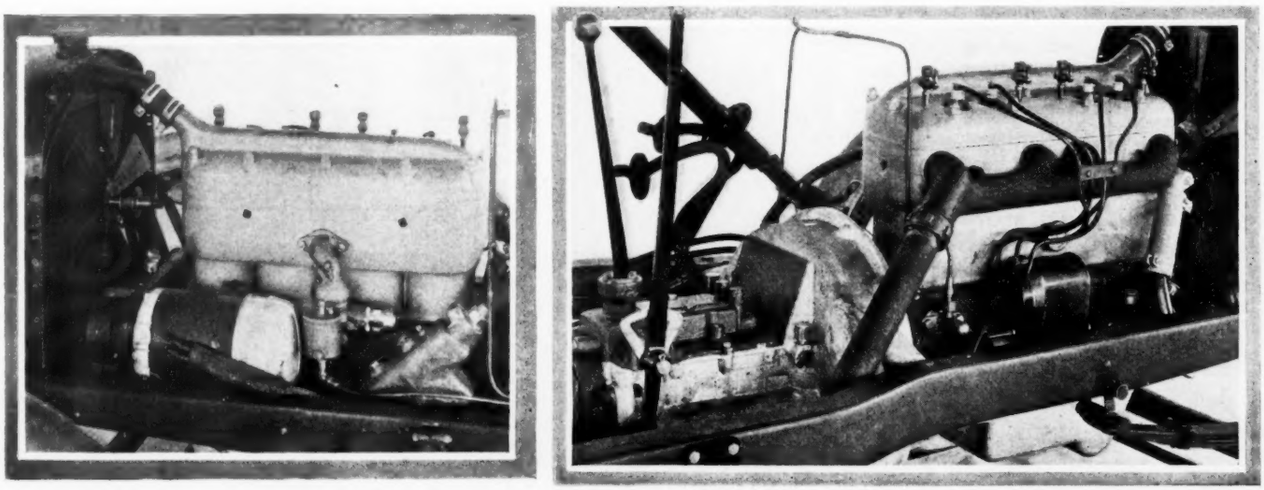


Dodge rear axle, showing torque tube carrying driveshaft. Note brake equalizers

The gearset is a three-speed, selective, sliding type, one which is unusual in that when on direct drive the countershaft gears do not rotate.

The train of gears driving the countershaft is shifted out of mesh when the dental clutch connecting mainshaft direct to power shaft is engaged. The gears are constructed of

(*Continued on page* 914)



Left—Intake side of Dodge four-cylinder block motor, showing mounting of North East electrical system. Right—Exhaust side of power plant, showing Eisemann magneto mounting

The Rochet-Schneider factory at Albert, Sommes, France, destroyed by the German army. The main plant is at Lyon and is safe

French Factories Suffer in War

One of Rochet-Schneider Plants Destroyed

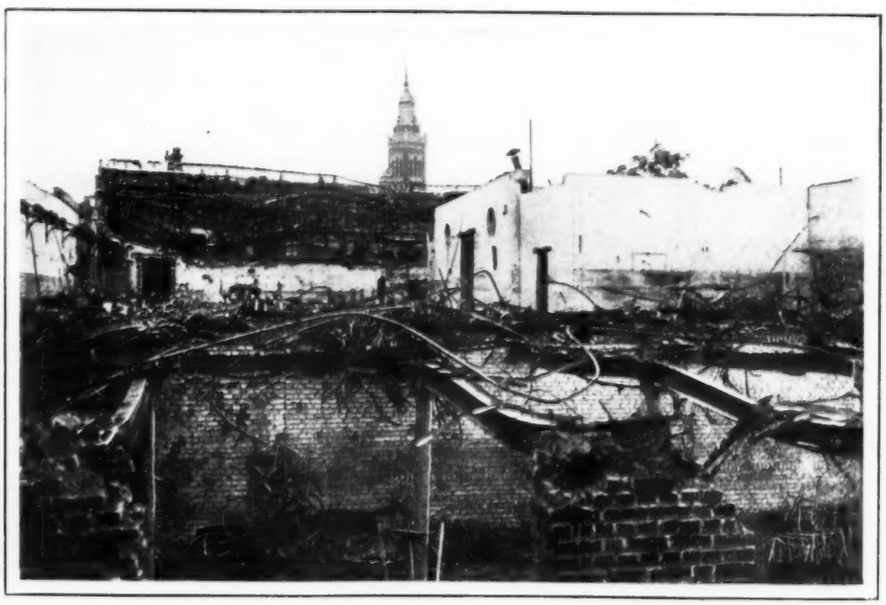
By W. F. Bradley

PARIS, Oct. 23—Owing to the severe censorship, travel restrictions, and the complete stoppage of all civilian automobile traffic, it is difficult to obtain accurate information regarding the fate of the factories allied to the automobile industry. Practically all these establishments—foundries, steel works, sheet metal works, etc., are in the north and northeast of France where the most severe fighting is taking place. Probably annoyed at their failure to get within striking distance of Paris, and the serious setback they received during and since the battle of the Marne, the German troops have made systematic attacks on French factories. If she cannot gain a military victory, Germany appears determined to crush the industrial development of France.

The Rochet-Schneider motor factory at Albert, in the Somme department, has been wantonly destroyed. Before entering the city the Germans shelled the factory, and on gaining possession of the town they completed their work by setting fire to the wrecked buildings. Blackened walls and twisted iron are all that remain of the works. The deliberateness of the attack is shown by the fact that the buildings around the factory have been spared and the conspicuous town hall, visible several miles away, has not been damaged.

Main Plant Is Safe

The main factory of the Rochet-Schneider company is at Lyon, well out of the military zone. The works at Albert are occupied largely with the production of bicycles and motorcycles and various accessories. In connection with the photograph of the wrecked factory, which was secured immediately the Germans were driven out of the town, it is interesting to note that the photographer was arrested on the suspicion of being a spy, was handcuffed and kept in prison for several hours. He was released and considerately treated by the French authorities on his identity being proved, but so thorough is the spy hunting campaign that the incident failed to excite attention or to call forth an excuse. Newspaper men and photographers in the war area must be prepared for this.



Another view of ruined Rochet-Schneider plant at Albert with town hall in distance

Directions for Oxy-Acetylene Welding

Specific Instructions for Welding Cast Iron, Malleable Iron, Aluminum and Alloys, Copper, Brass, Bronze, Etc.—Speeds in Work—Educating the Workman —Fluxes—Cutting Metals by Oxy-Acetylene Flame

By H. Sidney Smith
Engineer Prest-O-Lite Co., Inc.

INDIANAPOLIS, IND.—Editor THE AUTOMOBILE:—In the automobile field the savings that can be effected by acetylene welding are enormous. This industry provides welding with a unique field. The process is generally employed for repairing cracked cylinders, gearcases, building up teeth on gears, repairing and reinforcing broken frames, constructing exhaust manifolds, etc.

As the process becomes more developed there is no doubt that it will be employed in the construction of motor cylinders built up from sheet iron parts welded together, especially in the case of aeroplane engines where light weight is an essential feature.

Flame for Hardening

The oxy-acetylene flame is now employed extensively for hardening the wearing surfaces of steel parts: it is applicable to such purposes as the hardening of the surfaces of gear teeth, template holes and in general to the local hardening of any small area upon a large piece, especially where case-hardening might cause distortion which it would be difficult to remove by grinding. The feature of the process is the quick transit of an intensely hot flame over the surface to be treated, so that it is raised in one continuous wave to hardening heat, and then as rapidly cooled as soon as the flame has passed, by the coolness of the remaining metal, leaving the surface at the maximum hardness the composition of the steel will allow. The hardening will be found to penetrate to a depth of about 1-16 inch.

In the tool room the process is found of service, especially in the construction and alteration of jigs, and economy in the use of high-speed steel can be effected by welding short pieces to lengths of inferior steel.

Blowpipe Welding

Oxy-acetylene welding is a process by which pieces of metal are melted and joined together by means of a flame of sufficiently high temperature, and additional metal of the same composition added if desired. The joint thus obtained is today commonly called an autogenous weld. As a matter of fact the weld obtained by forge welding or by the electrical process can be called autogenous, as use of a metal cement is not necessitated as is the case with a brazed joint. But it is general today to use the term autogenous weld only in connection with welds effected by means of a gas blowpipe.

Flame temperatures produced by the combustion of a fuel gas in air or oxygen depend on two factors, the calorific value of the fuel gas and the nature of the products of combustion. Taking the case of a fuel gas with a high calorific value burning to products of low specific heat, we have a flame of high temperature, but if the products of combustion have a high specific heat the flame temperature is lowered proportionately. As an example, suppose we burned sufficient hydrogen to produce a fixed number of heat units, and then burned sufficient carbon to produce a similar number of heat units; in the first case the product of combustion would be water vapor and in the other carbon dioxide (CO_2). Water vapor, however, has a mucb higher specific heat than CO_2; hence the temperature of the hydrogen flame would be low as compared with the carbon flame or fire, as the flames have to supply the heat to raise the temperature of the products of combustion.

Gas Characteristics

With the exception of hydrogen, all fuel gases burnt with oxygen in a blowpipe consist of carbon and hydrogen, and therefore their combustion results in the production of water vapor and carbon dioxide; the less the quantity of water vapor produced, the higher will be the flame temperature. It will, therefore, be appreciated that the gas having the highest percentage of carbon will produce the highest flame temperature. Acetylene (C_2H_2) has a higher specific gravity and calorific value than any of the commonly employed fuel gases; it contains but about 7 per cent. of combined hydrogen and is the nearest possible approach to gaseous carbon. Pintsch, natural, coal, Blau, water, and other fuel gases all contain 2 to 50 per cent. free hydrogen and also more hydrogen in combination. This hydrogen burns to water vapor, which, as before stated, has a high specific heat and will absorb heat and lower the flame temperature.

Oxy-Acetylene Welding

Oxy-acetylene welding was first practiced about 13 years ago. Previous to that time it had been fully appreciated that wonderful results would be obtained from using oxygen and acetylene in a blowpipe, but it had been found impossible to construct a blowpipe that would consume acetylene at low pressure. Acetylene under pressure then came on the market and the blowpipe difficulty was soon overcome.

At a later date, injector blowpipes were produced which permitted a low-pressure acetylene being employed. Experience has proved that the best results are obtained when acetylene is delivered at the burner tip under considerable pressure. Today it is usual to obtain acetylene from a pressure generator or from a cylinder of dissolved acetylene with any type of blowpipe, or to use an injector-type blowpipe drawing the acetylene from a low-pressure apparatus with excess of pressure on the oxygen supply to provide power to suck in the acetylene and deliver the mixture of gas to the blowpipe nozzle at a suitable pressure. However, there is no doubt whatever that in order to obtain economy and really satisfactory working, both gases should be delivered to the blowpipe under pressure.

One volume of acetylene (C_2H_2) requires theoretically 2 1-2 volumes of oxygen to burn it completely to its products of combustion, which are carbon dioxide and steam; but in actual practice it is found that 1.1 or 1.5 volumes of oxygen only have to be supplied to the blowpipe to 1 volume of acetylene, depending upon the nature of the acetylene supply and the blowpipe employed.

Qualities of Gas

Acetylene is an endothermic gas and immediately on issuing from the nozzle of the blowpipe dissociates or splits up

into its two constituents, carbon and hydrogen. The carbon burns with the oxygen supplied through the blowpipe to form CO, producing the white flame at the nozzle. In order to form CO, equal volumes of acetylene and oxygen are required, but then another phase of combustion takes place; the CO burns to CO_2 and the hydrogen later combines with oxygen to form steam. If a blowpipe could supply an absolutely perfect mixture of equal volumes of acetylene and oxygen at its nozzle, the remainder of the oxygen required to burn the CO to CO_2, and the hydrogen to steam, could be extracted from the air. This has not yet been quite attained and in practice some of the oxygen required to burn the CO to CO_2, has to be supplied through the blowpipe, although as stated above, the best blowpipes produced today require only 1.1 volumes of oxygen to 1 volume of acetylene.

It should be understood that the hydrogen combines with the oxygen of the atmosphere only after it has passed away from the high temperature zone of the white welding flame, the temperature of which is about 6300° F., at which figure it is impossible for steam to exist, as it is far beyond its dissociation temperature. The result is that the molten metal is surrounded by free hydrogen, tending to prevent oxidation, the hydrogen also protecting the inner, or welding, flame from loss of heat.

Two Types of Equipment

There are today in the field two styles of welding outfits, commonly known as the high- and low-pressure systems. With the low-pressure system the acetylene is supplied from an acetylene generator which delivers gas to the blowpipe at a pressure of 2 or 3 ounces, and the oxygen is supplied under pressure in an ordinary trade cylinder. The low pressure of the acetylene supply necessitates the employment of blowpipes of the true injector type, in which excess pressure has to be used on the oxygen supply in order to suck in sufficient acetylene and deliver the mixture of gases at the blowpipe nozzle at a proper pressure. With this method it is more or less impossible to get perfect mixtures of the gases, and the oxygen consumption is undoubtedly higher than when both gases are supplied under pressure. A certain unsteadiness of the flame also has to be contended with. Notwithstanding its drawbacks the low-pressure generator system has one important point in its favor as compared with the high-pressure generator system, namely, that the insurance companies look upon it with much less disfavor.

The high-pressure system of oxy-acetylene welding may be sub-divided into two classes: first, the plant in which the acetylene supply is obtained from a generator which delivers and generates the acetylene gas under pressure; and second, those plants which employ cylinders of dissolved acetylene instead of the high-pressure generator. With both these styles of plants, any type of blowpipe can be employed, and as both gases can be delivered to the blowpipe under pressure, a nearly perfect mixture of gas can be delivered to the blowpipe nozzle, which is not the case when the oxygen only is delivered to the blowpipe under pressure, as in the low-pressure system.

High-pressure acetylene generators are looked upon with disfavor by all insurance companies, and in some cities their use is prohibited by the authorities on account of the many accidents which have occurred through their employment. They are, as a rule, designed to deliver the gas at a pressure not exceeding 15 pounds to the square inch. Under this pressure acetylene, if it has no air mixed with it, is not explosive, but at times the class of generators under consideration gets out of order, excess pressure frequently being the result. At 30 pounds pressure acetylene is explosive, and between 15 and 30 pounds its action is somewhat uncertain.

Using Dissolved Acetylene

Where dissolved acetylene is employed instead of a high-pressure generator, immunity in respect to accident due to excess pressure is obtained, due to the fact that the acetylene while under pressure is stored in a porous mass contained in the cylinders, which makes it quite impossible to propagate an explosion through it. Acetylene, when delivered from the generators always contains a small percentage of impurities which are, as a rule, ammonia, sulphuretted and phosphoretted hydrogen. These can be eliminated from the gas if proper purifying apparatus is installed with the plant, but this is very seldom done, with result that the gas delivered from the high-pressure generators always contains a small percentage of the impurities mentioned above. Any one familiar with the working of iron and steel will appreciate fully what will occur if molten iron or steel is brought into contact with the gas containing phosphoretted and sulphuretted hydrogen. When dissolved acetylene, however, is used, instead of a generator, this possibility is overcome, due to the fact that manufacturers of dissolved acetylene always wash, dry and purify their gas before compressing it into cylinders.

Impurities in Weld

Many tests have been made to find what effect the presence of phosphoretted and sulphuretted hydrogen has on a weld. A number of gasoline and gas containers were welded, some with unpurified gas drawn from an acetylene generator, and others with gas drawn from a cylinder of dissolved acetylene. All the welded vessels were tested under pressure, and it was always found that those welded with the unpurified gas did not survive as well under the test as did the others. It may also be noted that when impure acetylene is used the welding flame is colored and much more difficult to regulate.

Users of acetylene generators are apt at times to overload them, with the result that there is undue heating. This heating may cause polymerization, or breaking up, of the acetylene itself. The presence of this altered gas in the pure acetylene will cause changes in the welding flame which affect very seriously the work and necessitate the use of more oxygen than if the acetylene were in a pure state. A cylinder of oxygen and a cylinder of acetylene can be moved readily on a truck to any position in a shop desired, whereas an acetylene generator should be stationary, although there are today on the market various acetylene generators which are stated to be portable. These, however, are not really suitable for welding work, as they are too small to generate gas fast enough to feed the blowpipes without undue heating, which, as mentioned above, is not only dangerous but deleterious to the acetylene itself.

Making Oxygen

Very few users of the oxy-acetylene process manufacture their own oxygen, but purchase it from the large oxygen manufacturers. For commercial purposes oxygen is manufactured by either the liquid air or the electrolytic process and can be obtained in a state of comparative purity from either class of plant. Any impurity contained in oxygen manufactured by the liquid air process is mainly nitrogen, and while freedom from nitrogen is desirable a slight percentage is not fatal to good welding of iron and steel. However, should the percentage of impurities exceed 1 1-2 per cent. the welds will be somewhat porous, due to the absorption of the nitrogen by the molten metal.

The purest possible oxygen should, however, be procured for welding aluminum, copper and brass, as at high temperature these metals have a strong affinity for nitrogen. Any impurity in oxygen made by the electrolytic process will be hydrogen; excess quantities will reduce the flame temperature and of course necessitate the use of more oxygen in the blowpipe. Electrolytic oxygen, however, is generally supplied in a comparatively pure state.

Strength of Weld

The strength of a weld produced by the oxy-acetylene flame is, as a rule, less than

that of the original metal unless certain precautions are observed.

This can easily be accounted for. It is rarely possible to obtain for filling-in purpose rods of similar material to that being operated on. It is common practice to use rods of high-grade Norway iron for filling-in. This permits of a sound, soft, homogeneous joint being made, but Norway iron has a low tensile strength as compared with the iron and steels of commerce that have to be operated on. This naturally weakens the weld as regards tensile strength. Tests have been given out from time to time which tended to show that steel plates up to ⅝ inch in thickness could be autogenuosly welded and that the weld was stronger than the original plate. This is impossible unless the material used for filling-in be of higher grade than the plate itself.

A claim of 100 per cent. weld strength is unsupportable. Practice has shown that with thin steel sheets, say, ⅛ inch thick, one can get a weld strength of 95 per cent. and that this figure falls to 85 per cent. for 1 inch thick plates. However, in most cases where welding has to be carried out there is no objection to adding a fillet of metal along the joint or using special high-tensile-strength steel for filling-in, when the welded portion can be made to equal or exceed the strength of the rest of the work.

Skilled Men Needed

Satisfactory results will never be obtained unless skilled workmen are employed to operate the blowpipes. It does not take very long for an intelligent workman to become a fair welder on straight-ahead work on steel plates and similar classes of work which does not exceed ⅜ inch in thickness. To weld metals under ⅛ inch thick requires considerable skill, which practice alone can produce. It takes considerable time for a beginner to attain the necessary steadiness of hand to make a neat weld and avoid piercing the plates. On this class of work buckling difficulties also have to be contended with, but experience soon shows how to overcome them.

Skill in Thick Material

To weld work over ⅜ inch thick takes very considerable skill, and honesty on the part of the operator is indispensable. It is impossible to judge the quality of a weld by merely examining the work after completion—it may have a good appearance and yet be poor work; that is to say, if the plate were fractured at the weld it might be found that the proper fusion had not taken place right through the section and a proper homogeneous mass produced.

The skill necessary to undertake this class of work should be attained after a few weeks' practice. Men employed on it should never be hurried; otherwise poor work will result. Piece-work should never be considered under any circumstances. Welding on thick plates is as a rule connected with work of importance; a faulty weld may have serious results; consequently unless the workman can be trusted, careful watching during the welding process is essential, as that is the only time when the bad work can be detected.

Anyone watching the welding process for the first time comes to the conclusion that the operation is very simple and that any workman can operate the blowpipe with little or no practice. This has been a somewhat serious handicap to the industry, as enthusiasts after seeing the process have purchased an equipment and then without any preliminary practice attempted to use it on work of some importance; of course, failure has been the result in most cases and the blame laid not to the operator but to the process.

Skilled Welder Essential

Oxy-acetylene welding must be considered a trade; a skilled welder is just as much of an artisan as the ordinary blacksmith. This has been appreciated fully in Europe, where welding schools are located at all important centers, and men are thoroughly instructed in the process; after leaving the schools they are placed out on probation in shops where the process is in general use; if, after a period, they have attained the necessary skill they are granted a certificate. Manufacturers will rarely employ a man for welding work who does not hold a certificate from one of the schools.

Cleaning the Parts

One of the chief points to be borne in mind, if oxy-acetylene welding is to be carried out successfully, is that very careful preparation of the work is necessary. The parts to be welded must be free from rust and grease.

When making butt or end-to-end welds on plates, it should be certain that the work is cut true. Plates over ⅛ inch thick must, when a butt joint is desired, be beveled and the opening across the top of the V should at least equal the thickness of the plate so as to make possible the metal being welded throughout the entire thickness of the plate.

Plates over ¾ inch thick should be beveled if possible on both sides; also welded from both sides.

Many workmen will try to weld plates up to ⅜ inch thick without beveling, but a poor joint is invariably the result, mainly due to burning of the metal, caused by too lengthy application of the blowpipe flame.

The welding together of plates of different thickness is somewhat difficult, but not by any means impossible; in most cases where this has to be done some special manipulation can be devised to make the job practical.

Welding Speed

The following table shows the speed at which the welding of steel and iron plates can be carried out; also the necessary acetylene gas consumption:

Thickness of metal Inches	Run Per Hour Feet	Acetylene Per Hour Cu. Ft.
1-32	30	3.25
1-16	25	5.00
3-32	20	8.25
1-8	15	12.00
3-16	9	18.00
1-4	6	25.00
3-8	4	42.00
1-2	3	60.00

The oxygen consumption will be 1.1 to 1.5 times the acetylene consumption, depending on the quality of the blowpipe employed. As would be expected for metal over ⅜ inch thick the gas consumption per foot run of work increases rapidly, and the speed at which the work can be done falls. This leads one to conclude that for constructional work 3-8-inch metal is about the thickest that should be worked, except in cases where older methods, such as riveting, are impossible. For repair work the case is altogether different; metal of any thickness can be worked, and in almost all cases the repairs effected will be made more quickly, better and more economically than by old methods.

Relieve Internal Strains

In every case of welding internal strains are inevitably set up, due to the metal expanding when heated and contracting when cooling. When the parts welded form part of a structure and are restrained during the welding process, the strains produced may cause cracking of the metal, especially in the case of cast iron; and the tendency to crack will be greatly increased if the cooling of the metal, after fusion, is rapid or irregular.

Whenever local strains exceed the strength of the metal, a fracture must occur.

In order to relieve welded metal from internal strains due to welding, it is desirable to preheat the whole work, before welding, and also to reheat it after the welding is completed. In the case of cast iron in a restrained part of a structure this treatment is imperative; the heating should be carried on slowly and the work kept free from air-drafts. This treatment is less essential for steel but can never be anything but beneficial.

Welding Cast Iron

To one not acquainted with the process, the welding of cast iron appears to be more difficult to accomplish than work

in steel or wrought iron, but such is not the case. Carbon exists in cast iron, in different states; in what is called white iron, which is very hard, the carbon is combined with or dissolved in the iron, but in gray iron, which is soft and easy to work, most of the carbon is in a free state in the form of graphite. Since it is generally necessary to work a weld in cast iron, it is indispensable that the line of welding be constituted of gray iron.

The obtaining of welds of gray iron depends on the state of the carbon in the metal. Rapid cooling tends to bring about the combination of the carbon and iron, that is to say, the formation of white iron. Slow cooling or reheating after the welding is completed tends to bring about the precipitation of the carbon and the production of a softer material.

It is found by employing silicon in the filling-rod in the form of ferro-silicon, the iron combines with the silicon in preference to the carbon and allows the carbon to take the form of graphite and thus facilitate the formation of gray iron.

The presence of manganese has exactly the opposite effect. It will be seen that in order to get good workable welds there must be slow cooling after the welding is completed. The filling-rod must contain a percentage of silicon, and there must be no manganese present.

Flux for Cast Iron

The welding point of ordinary cast iron is lower than that of iron or mild steel and lower than the melting point of iron oxide; therefore, if any oxides are formed during the welding process they cannot be melted and blown away by the flame as is the case where iron or steel is fused, when this can be done, due to the fact that the melting point of the steel is higher than that of the oxide. It will, therefore, be seen that when welding cast iron it is necessary to employ some flux to break down any oxides formed. When working on thick cast iron the parts to be joined should be beveled as for steel.

Avoiding Breaks

Cast iron is a comparatively poor heat conductor, and has no elasticity or elongation before rupture. It is therefore necessary to appreciate that when welding it expansion and contraction may bring about breaks if the parts oppose free play of the metal, and special precaution must be taken to prevent this. When the size of the piece to be welded allows complete preheating of the whole and slow cooling, breaks or cracks are not to be feared, but with large castings where total preheating is impossible, the welder must exercise thought as to how he can overcome the effects of expansion and contraction by heating other parts of the piece away from the welding point.

The welding of malleable iron is a somewhat difficult and uncertain operation. Malleable castings are supposed to be of the same texture throughout, but in some cases consist of a core of cast iron surrounded by a layer of iron. It will be appreciated that between the surface of the casting which is nearly free from carbon and the core which is cast iron, there exists a more or less carbonized zone. In some cases where castings have thin parts which are properly decarbonized and the fracture is in the thin part, the welding can be carried out just the same as in mild steel. In the thick part of a casting, however, it is different, as the metals of the core and the surface are not the same and require altogether different treatment.

Aluminum Field Large

The welding of aluminum by the oxy-acetylene process provides an enormous field. Those attempting the work for the first time are apt to be discouraged by their failure, which is common until a few little points have been mastered.

The melting point of pure aluminum is about 650 degrees Centigrade, and the metal is very fragile in the near neighborhood of this temperature. It is the low melting point combined with high conductivity and specific heat that makes welding difficult for the beginner. The high melting point of the oxide (alumina) as compared with that of the metal itself has to be contended with also.

To insure good welds the work must be absolutely clean. To remove all traces of oil from an old aluminum casting takes considerable time; this is best done by heating slowly over a charcoal fire and carefully wiping the oil away as it exudes from the metal. The welding or filling-rod employed on pure aluminum must also be quite pure, as the introduction of foreign elements may bring about disintegration along the line of welds.

The low melting point of the metal necessitates skilful manipulation of the blowpipe, although a hot and fairly large flame is necessary on account of the high conductivity. The oxide formed during fusion does not necessarily rise to the surface as it is denser than the metal; it is therefore essential to use a proper flux. It might seem that deformation of castings due to expansion would be difficult to overcome, but such is not the case in practice, as the high conductivity of the metal tends to distribute the heat over the whole mass. When preheating a casting before welding, care should be taken not to raise the temperature to over 500 degrees Centigrade; otherwise it may deform under its own weight.

The welding of aluminum alloys, particularly aluminum zinc, is more important than the welding of the pure metal, as most castings are made of this alloy. The percentage of zinc varies as a rule from 10 to 30 per cent., and copper is generally present in small quantities. It is impossible to know the composition of all aluminum alloy castings that come along for repairs; therefore it is necessary to use a filling material that will be generally serviceable. Rods made up of 88 per cent. aluminum, 10 per cent. zinc, 2 per cent. copper, give good results.

Aluminum alloys are not very ductile; hence trouble from expansion and contraction must be guarded against. Some castings have ribs which tend to produce cracks during cooling and in some cases it may be necessary to cut the ribs to allow for the necessary expansion and contraction. These can easily be welded up later.

Good Work in Copper

Until quite recently the successful welding of copper was considered impossible, but this was due to the fact that welders were ignorant of the disturbing factors which contributed to poor results and took no steps to counteract them. It is easy to make a joint that has the appearance of a good weld, but a full knowledge of the nature of the metal and how it should be treated is required before welds can be made that not merely look good but prove under test to be as strong and malleable as any high-grade copper.

To obtain good results special filling-in-rods must be used; the best results are obtained with phosphor-copper rods which are specially manufactured for welding work. It must not be thought that any phosphor-copper is suitable; the amount of phosphorus must be just enough to do the work required of it and no more.

A good flux to employ when welding copper consists of a mixture of salt, borax and boric acid, but should be used sparingly.

After welding the work should be reheated and hammered along the weld, again reheated, and if possible plunged in water. Copper when heated radiates its heat very rapidly, and as it is also an exceptionally good conductor of heat it is found that the heat of the blowpipe alone when dealing with large masses of copper is not sufficient to keep up the fusion; therefore additional heat supply should be provided and as much of the work as possible covered with asbestos to prevent radiation.

The employment of phosphor-copper as a filling-rod prevents the formation of copper oxide, which in excessive quantities renders a weld extremely fragile and weak, although a small quantity of this oxide is not detrimental and is considered by some to improve the quality

of the metal. Molten copper will dissolve hydrogen and carbon monoxide in considerable quantities and when the metal solidifies the gases are evolved. This causes a frothing of the metal in solidification, the resulting metal being spongy. Unfortunately the gases present in the blowpipe flame are those on which copper exerts its solvent property, but the use of phosphor-copper prevents this, the phosphorus either suppressing their solution or aiding their evolution before the metal solidifies.

Copper has a high coefficient of expansion; the consequence is that in cooling considerable stresses may be set up due to contraction, and as coppper has very low tensile strength these, unless counteracted, may cause fractures; but precaution can be taken to prevent this and as a rule the contraction stresses can be nullified by opposing them by means of local heating applied to certain parts, dependent on the shape of the article, or by proceeding with the welding on a certain plan.

Brass Welds Easy

The welding of brass is quite simple, although it would appear at first sight that evaporation of the zinc would be detrimental. This difficulty is overcome by the employment of special welding rods containing a small percentage of aluminum.

A good flux to employ when welding brass consists of a mixture of sodium-chloride, borax, and boracic acid. Hammering of brass after welding considerably improves the metal. It should be done cold on brass with a high percentage of copper, and hot on brass with a low percentage of copper. After cold hammering the brass should be annealed.

Neutral Flame in Bronze

The welding of bronze requires that the welding flame be quite neutral. Special welding rods have to be used, containing a percentage of phosphorus in proportion to the nature of the bronze. A similar flux to that employed in brass may be used. Annealing after welding is essential.

Metal Cutting by Flame

It is probably not out of place to refer to the development of metal-cutting by means of oxygen. The blowpipe used for cutting metals by oxygen generally consists of an oxy-acetylene blowpipe fitted with a central following jet for oxygen only. The work that has to be cut is first of all heated up by means of the oxy-acetylene jet, and as soon as it is raised to a temperature at which oxygen will ignite it, the separate oxygen jet is turned on, and the metal at once burns away very rapidly.

The oxygen supply has sufficient pressure behind it to blow away the oxide as it is formed, with the result that a clean, narrow cut can be made through plates up to 12 inches in thickness and over. The speed at which this work can be done is high, varying from 100 feet per hour for metal 1-4 inch thick to 12 feet per hour for metal 12 inches thick; the oxygen consumed in this process varying from 0.50 cubic feet per foot run in 1-4-inch plates to 50 cubic feet in 12-inch plates.

The users of the oxy-acetylene welding process find it most advantageous to have oxygen-cutting blowpipes in conjunction with their plants. They are found most useful in preparing work which has to be autogenously welded, more particularly in opening out cracks.

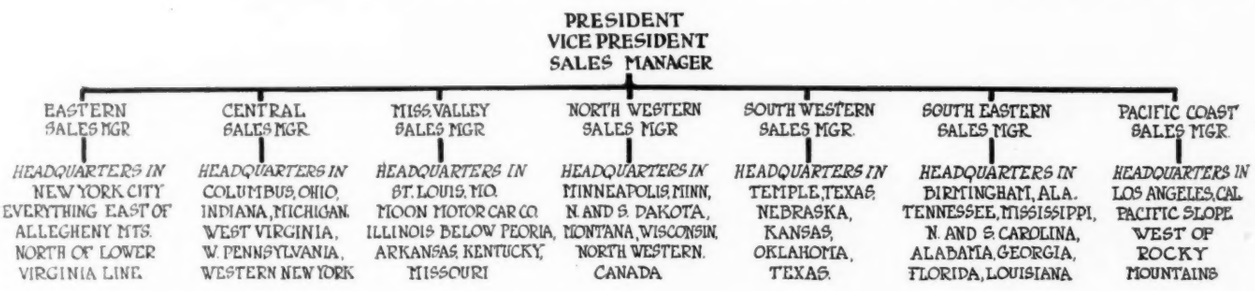
Miscellaneous Application

It will be appreciated that the applications of autogenous welding are innumerable when it is considered that it is possible to weld practically almost any commercial metal without in any way seriously altering its nature, and to add at will any metal to any piece of work. The following are some of the applications to which the process is put today:

Repairs to all classes of boilers in place, such as building up wasted landings and corrosion, repairing cracks in flues and patching same. Repairing cracked or broken castings of any metal. Making good castings that come from the sand with blow or sand holes.

It replaces brazing on cycle frames, forks, and wheel rims. The manufacture of small steel boats; substituting riveting. Manufacture of safes; castings impossible to mold can be made in parts and united; artistic ironwork; railway steel car construction and repairs; building up parts worn by friction; pipe jointing; repairs to locomotive frames, cylinders, boilers, etc.; manufacture of steel barrels; manufacture of air and gas containers; filling up holes drilled in error, and many others.—H. SIDNEY SMITH, Engineer of the Prest-O-Lite Co., Inc.

How the Moon Sales Department Is Organized


PRESIDENT
VICE PRESIDENT
SALES MANAGER
EASTERN SALES MGR
CENTRAL SALES MGR
MISS. VALLEY SALES MGR
NORTH WESTERN SALES MGR
SOUTH WESTERN SALES MGR
SOUTH EASTERN SALES MGR
PACIFIC COAST SALES MGR
HEADQUARTERS IN NEW YORK CITY EVERYTHING EAST OF ALLEGHENY MTS. NORTH OF LOWER VIRGINIA LINE.
HEADQUARTERS IN COLUMBUS, OHIO, INDIANA, MICHIGAN, WEST VIRGINIA, W. PENNSYLVANIA, WESTERN NEW YORK
HEADQUARTERS IN ST. LOUIS, MO. MOON MOTOR CAR CO. ILLINOIS BELOW PEORIA, ARKANSAS, KENTUCKY, MISSOURI
HEADQUARTERS IN MINNEAPOLIS, MINN, N. AND S. DAKOTA, MONTANA, WISCONSIN, NORTH WESTERN CANADA
HEADQUARTERS IN TEMPLE, TEXAS, NEBRASKA, KANSAS, OKLAHOMA, TEXAS.
HEADQUARTERS IN BIRMINGHAM, ALA. TENNESSEE, MISSISSIPPI, N. AND S. CAROLINA, ALABAMA, GEORGIA, FLORIDA, LOUISIANA
HEADQUARTERS IN LOS ANGELES, CAL. PACIFIC SLOPE WEST OF ROCKY MOUNTAINS

The sales organization of the Moon Motor Car Co., St. Louis, Mo., is divided in several districts, all presided over by the sales manager, who reports to the vice-president.

The sales manager of the Eastern district William J. Coghlan, with headquarters in New York City, handles everything east of the Alleghanies and north of the lower Virginia line.

Southeastern sales manager O. M. Graham covers Tennessee, Mississippi, Alabama, Georgia, North and South Carolina, Florida and Louisiana.

Central sales manager J. H. Gibson, who was formerly sales manager of the Hudson company, covers Illinois below a line drawn through Peoria, Missouri, Arkansas and Kentucky. Mr. Gibson makes his headquarters in St. Louis.

Ohio territory is covered by P. J. Eubanks, formerly the sales manager of the Chicago Electric Co., with headquarters in Columbus, and he also handles Indiana, Michigan, West Virginia, western Pennsylvania and western New York.

The northwestern sales manager, J. A. O'Brien, makes his headquarters in Minneapolis. He also covers North and South Dakota, Montana and the northern portion of Wisconsin, as well as such Canadian territory which is tributary to Minnesota, namely Saskatchewan and Manitoba.

Southwestern sales manager, Guy Nunnelly, handles Nebraska, Oklahoma and Texas, and makes his headquarters in Temple, Tex.

The Pacific Coast sales manager, E. N. Sanders, who was formerly manager of the Moon Motor Car Co. of Illinois, in Chicago, but for the past 2 years on the Coast, with headquarters in Los Angeles, takes charge of all the business west of the Rocky Mountains.

In dividing the country like this, the Moon company feels that the introduction of local sales managers and the possibility of getting in closer touch with the dealers answer their requirements more promptly than would otherwise be the case.

Each sales manager has full authority and is empowered to conduct his business without any additional authority,

Saving 7 Per Cent. of Trucks' Time

Study of Boston Freight Terminal Shows This May Be Made By Small Changes—Amounts to 42 Minutes in 10-Hour Day

EDITOR'S NOTE.—*This is an abstract of a paper presented before the New York Railroad Club, entitled, "The Delivery and Handling of Miscellaneous Freight at the Boston Freight Terminals," by Harold Pender, H. F. Thomson and C. P. Eldred. It is copyrighted and all rights are reserved.*

THAT a saving of 7 per cent. can be made in the working day of the trucks using the railroad freight terminals in Boston is the conclusion drawn in a paper presented to the New York Railroad Club, at the monthly meeting Sept. 18, 1914. In a 10-hour day this amounts to 42 minutes, and this, coupled with a somewhat greater possible reduction at the warehouses in loading and unloading, shows that the amount of useful work a truck may do can be largely increased. This reduction is of more importance to the economical operation of motor trucks than of horse-drawn ones because of the greater speed of the former. In fact, this fact might, under certain conditions, make it more profitable to operate motor trucks, where before it had been cheaper to use horse trucks.

This 7 per cent. of the total working day represents 18 per cent. of the time spent in the freight yards. The time lost may be divided up into several parts. Waiting for a place at the freight house doors to load or unload causes some loss, especially during the rush periods in the early morning and late in the afternoon. At these times the yards are crowded with vehicles, while at other periods of the day they are comparatively empty. Some time is lost in searching for freight and calling at doors without loading. A large part of this time can be saved by simple changes in the clerical work. Closer co-operation between the drivers and the railroad employees would reduce the time in loading and unloading. Contrary to expectation, very little time is lost by the loafing of the drivers, and the small amount of time the drivers do waste is chargeable to the extremes of weather. Better pavements would reduce the time a small amount, especially in bad weather, and so would better location of the various freight houses.

This paper, entitled, "The Delivery and Handling of Miscellaneous Freight at the Boston Freight Terminals," was prepared by Harold Pender, H. F. Thomson and C. P. Eldred, and was the result of an investigation of freight conditions around Boston extending over a year. The investigation was started by the Electrical Engineering Department of the Massachusetts Institute of Technology in the Spring of 1912, when several students made a number of observations on the movements of all kinds of vehicles at the Boston freight terminals. This resulted in two railroads contributing $2,000 jointly for the appointment of a research assistant, and during the past year he has devoted his entire time to this work, under the supervision of the Research Department of the Electrical Engineering Department of the Institute.

This study was made because of considerable criticism, from time to time, on the part of the shippers, and truck drivers of the terminal facilities and of the methods employed by the railroads in sending out notices, and in delivering freight, particularly, less than car load lots, or L. C. L. shipments as railroad men are accustomed to calling them.

Before considering the conclusions drawn in this paper in detail, an understanding of the system of handling freight must be had. There are three railroad freight terminals, as shown by the map of the city, Fig. 1. The N. Y., N. H. & H. is represented by the five blocks in the lower right-hand corner which represent eleven freight houses and two piers. The two small blocks to the west of the South Station (Boston Terminal) represent the four freight houses of the Boston & Albany railroad. The string of blocks on the upper part of the map to the north and west of the North Station (Union Station) represent the thirty-five freight houses of the Boston & Maine.

The New Haven's terminal, the Boston & Albany terminal and one division of the Boston & Maine are each approximately 1 mile from the center of the city.

The study has been confined to the handling of loads of less than one car.

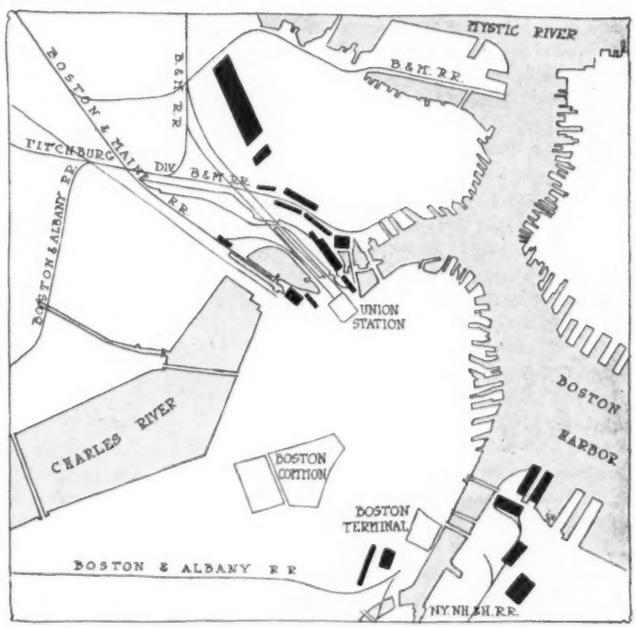


Fig. 1—Boston, showing freight terminals of the three railroads

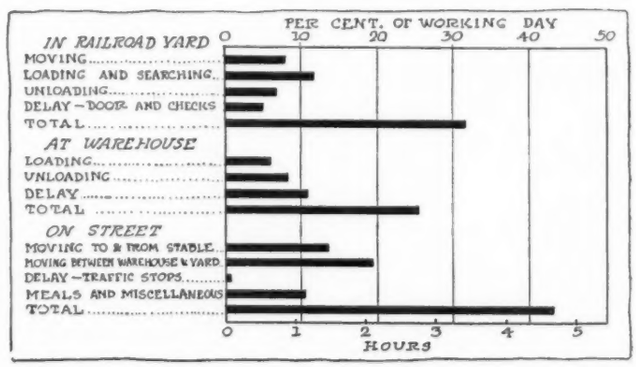


Fig. 2—Analysis of performance of eight wagons during 8 days

Inward and outward shipments are generally handled through separate houses. At the inward freight houses the driver must locate and load his freight. He first receives, at the cashier's office, a delivery check which designates the house and usually the door at which the freight will be found. After arriving at the door, he must pick out his freight and load it. In case the teamster finds freight in the house for which the delivery check is not available, he may load it upon obtaining a memorandum check from the cashier.

At the outward houses the teamster must distribute his freight at one or more doors according to its route and destination. Then he obtains a receipt from the railroad.

The New Haven and the Boston & Maine issue loading books which state the house and door number at which the freight will be received, but generally the truck drivers are allowed to unload at any door in the immediate vicinity of the one specified. This tends to avoid congestion and also to make it unnecessary for a teamster to move his wagon from door to door in case he has freight for several points normally unloaded at doors near one another.

The regular delivery check for each consignment is made out in the freight agent's office from the waybill, the latter either coming with the consignment or by mail. The delivery check is then sent to the cashier's office and the proper door number is written on it as soon as the information is received from the delivery clerk in the freight house. The check is then put into a pigeon hole near the window of the cashier's office, where it is available when the teamster calls for it.

The Memorandum Check

The system of using memorandum checks referred to is to enable consignees who expect freight to obtain it as soon as it is placed in the freight house, without waiting for the regular delivery check to be filed. A teamster is permitted to enter the freight house and look for such freight, knowing approximately where it is likely to be located. After finding it he may go to the cashier's office and obtain a memorandum check and the freight will be surrendered by the delivery clerk on presentation of this check. This system, although it requires the driver to spend more time at the freight house, is of considerable advantage to consignees in case of error.

In conducting the test, the first point determined was the percentage of time spent in the yards by one and two-horse trucks. It was found that these spent approximately one-third of the day in the yards. This is shown graphically in Figs. 2 and 3.

After this it was determined that the delay per day at the warehouses, or stores was actually greater than the delay due to the congestion in the railroad yards. Observation on 700 loads showed that the average delay at the warehouses was 38 minutes, as against 29 minutes at the yards. These were for two-horse wagons composed chiefly of goods packed in barrels, and averaging slightly over 4 tons.

In another case observations on two and three-horse wagons showed that an average of 51 minutes elapsed between the arrival and departure of the trucks at the warehouse. Of this time, only 16 minutes were spent in loading, the remaining 35 minutes being consumed in waiting for a turn at the loading platform. This fault was due chiefly to poor assignment of the wagons, more being used than could advantageously be employed under the conditions.

The relative times spent by the different types of vehicles in visiting a given freight house or group of houses is indicated graphically in Fig. 4.

Inward Peak at 9 A. M.; Outward, 5 P. M.

The number of vehicles calling at the outward and inward freight houses throughout typical days was also observed, and the results were plotted, Fig. 5. The peak of the inward traffic occurred at 9 a. m. and the peak of the outward traffic at 5 p. m. The relative volumes of traffic are proportional to

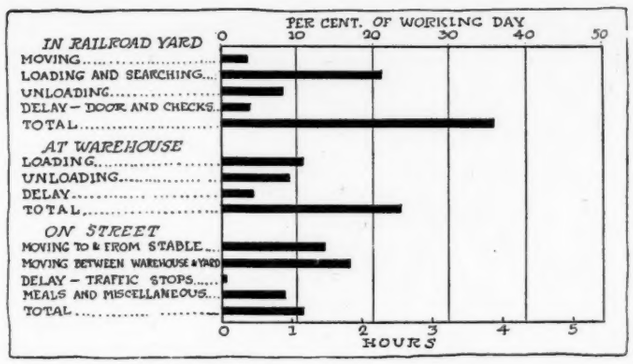


Fig. 3—Analysis of daily wagon performance based on 13 days' observations on four wagons

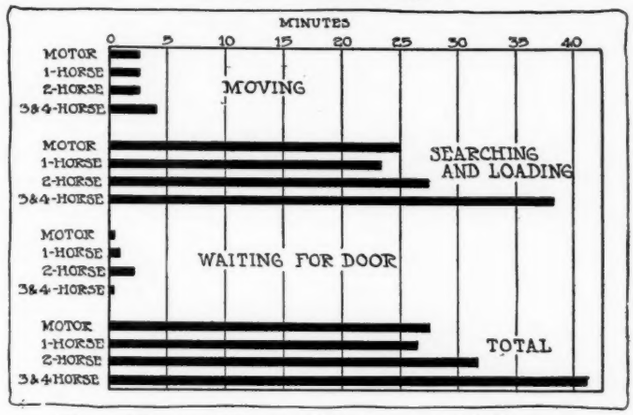


Fig. 4—Times spent per vehicle at inward freight houses

the areas under the curves. These curves show that about 30 per cent. of the total inward traffic is between 7 and 9.30 and that about 35 per cent. of the outward traffic occurs between 4 and 5.30. These curves show that one of the greatest difficulties encountered by the railroads is the necessity of providing facilities which are utilized to their maximum capacity during only 1 or 2 hours per day.

1.1 Minutes Waiting for Turn

Further observations showed that time lost in waiting for one's turn averaged 1.1 minutes during the afternoon, traffic being heavier then. On the average, each vehicle made 3.5 calls per trip at the outward houses, the total delay thus resulting being 3.5 times 1.1, or 4 minutes.

Similar determinations at the inward freight houses showed that the average wait per door was .6 minute, and that the average door calls were 2.5 per trip. Therefore, the average wait was 1.5 minutes.

The time spent in waiting for a turn is the only lost time chargeable to the railroads at the outward houses. At the inward houses, however, there may also be a delay due to three causes: inquiries at the cashier's office; loafing of the driver; searching for freight by driver.

An analysis of the total time spent by trucks at the inward freight houses is given in Table I, page 892.

Inquiries at Cashier's Office

Six per cent. of the total time spent in the freight yard is consumed in making inquiries at the cashier's office. This time is spent chiefly in obtaining memorandum checks for shipments whose delivery checks are not available, and correcting errors on delivery checks as discovered by the driver. As a large proportion of the calls are for memorandum checks any improvement in the handling of freight that would render these unnecessary would result in a time-saving.

Time spent by the driver in loafing about the cashier's office was found to be an appreciable item, especially on very

Fig. 5—Illustrating the congestion in the freight yards early in the morning and late in the afternoon

TABLE I.

ANALYSIS OF TOTAL TIME SPENT BY WAGONS* AT INWARD FREIGHT HOUSES

Number of wagons observed	88
Average number of house calls per yard call	1.3
Average number of door calls per yard call	1.8
Average number of pieces per wagon	23
Average weight per piece, in pounds (approx.)	120

Item	Av. time per wagon in freight yard	
	Minutes	Per Cent.
CASHIER'S OFFICE:		
Checks	3.8	8.1
Inquiry	2.8	6.0
Loafing	1.9	4.1
	8.5	18.2
FREIGHT HOUSE DOOR:		
Giving receipt and making inquiries of Delivery Clerk	2.2	4.7
Searching (including calls without loading)	4.1	8.9
Loading	16.2	34.8
Delay at door	0.5	1.0
Helping other drivers	1.0	2.1
Roping, etc	2.3	4.9
Loafing	1.6	3.4
	27.9	59.8
Moving in Freight Yard	10.3	22.0
Total	46.7	100.0

*These wagons on the average carried somewhat lighter loads than those on which the data given in Figs. 2 and 3 were obtained.

TABLE II.

ESTIMATED DISTRIBUTION OF TOTAL TIME IN YARD FOR AVERAGE TWO-HORSE WAGON

(Wagon receiving freight calls on the average at 1.5 houses and at 1.5 doors per house. Wagon delivering freight calls on the average at 2 houses and at 1.75 doors per house.)

Distribution of time	Time in yard for wagon to obtain load, minutes			Time in yard for wagon to deliver load, minutes		
	Present	Possible reduction by railroad	Net time after reduction	Present	Possible reduction by railroad	Net time after reduction
Obtaining checks	4	..	4	..	..	..
Receipts and inquiries	5	2	3	..	..	..
Waiting for door	1.5	..	1.5	4	1	3
Searching for freight, including calls without loading	8	5	3	..	..	..
Loading or unloading	35	5	30	25	4	21
Loafing	3.5	..	3.5	..	..	..
Moving in freight yard	10	1	9	10	1	9
Total	67	13	54	39	6	33

cold or hot days. The average loafing time in December, March and April was 7 per cent. of the time in the yard.

The average time spent in searching for freight was 9 per cent. of the total time, or 15 per cent. of the time at the freight house door. In some instances this time was spent in locating freight for which the delivery check was not available, and which the driver wished to make out a memorandum check for. A part of the searching was caused by the crowded condition of the houses, but the chief causes were the scattered consignments and neglect to place the pieces of freight so that the identification marks could be read easily. In some cases searching was indirectly due to the poor manner in which the goods had been packed and marked by the shipper—in the rehandling packages had become so battered that the addresses were almost unrecognizable.

It frequently occurs that a consignment of goods billed in one car will arrive in several cars and will therefore be scattered over the freight houses when unloaded. The remedy for this lies at the point of loading.

In many cases it was found that a wagon would call at a door and leave it without loading any freight, and observations showed that the time thus spent averaged 1.7 minutes per call. These delays were due to errors on the delivery checks and errors by drivers. In certain cases the omission of the door locations arose from the fact that the office work was ahead of the yard work and the drivers preferred to obtain the delivery checks without locations designated, and to search for the freight. Errors on the delivery checks were due to carelessness in making out the checks, to illegibility of the waybills from which the checks were made, or to the shifting of a car before it was unloaded to a position other than that reported to the cashier's office.

The above observations and the times which might be saved are summarized in the accompanying Table 2. No additional houses nor any radical change in equipment would be required to carry out these suggestions.

According to this estimate 13 minutes may be saved from the time now spent in the yards to obtain a load, while 33 minutes may be cut from the time consumed in unloading.

Obtaining Checks

This item includes the time spent by the teamster at the cashier's office in obtaining delivery checks and settling bills. The time of 4 minutes could not be reduced.

Under this head comes the time spent by the driver in making inquiries at the cashier's desk, in telephoning about lost shipments, in giving receipt to the delivery clerk and in making inquiries in the freight house. This time of 5 minutes could be reduced by greater care in making out the delivery checks, which in turn are often due to errors in the waybills. Errors in both could be reduced if the practice of making them out on a typewriter were universal.

This item was found to be surprisingly small, only 1.5 min-

(*Continued on page* 900.)

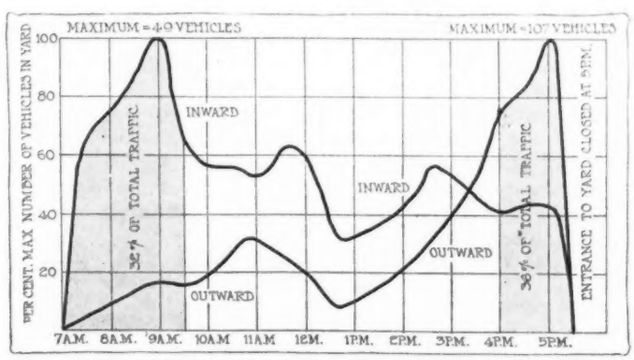
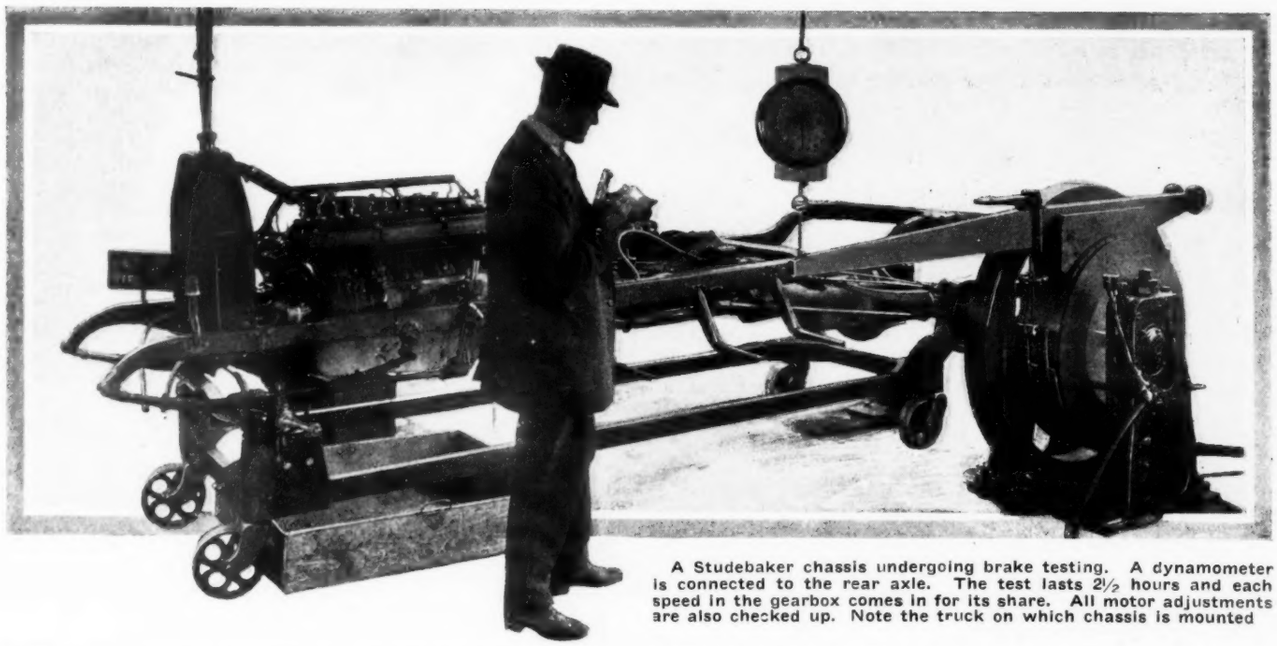


Fig. 6—Curves showing the amount of traffic both ways at various hours. It is heaviest at 9 in the morning and 5 in the afternoon

Studebaker Tests by Dynamometer



A Studebaker chassis undergoing brake testing. A dynamometer is connected to the rear axle. The test lasts 2½ hours and each speed in the gearbox comes in for its share. All motor adjustments are also checked up. Note the truck on which chassis is mounted

IN a long, narrow building the Studebaker Corp., Detroit, Mich., has installed nineteen dynamometer testing stands for trying out the new chassis as they come from the assembly departments. Along the 300 feet of length there are water mains for supplying radiators from a main tank, gasoline mains for providing motors with fuel and dynamometers for registering the power developed.

For 2 1-2 hours each chassis is run under load in this department before it can further advance in its journey to completion. Coming to the testing room on a form of iron truck which has been its steady companion ever since assembly began, the chassis is pushed to a test stand and made ready for work. At the back of the stand there is a substantial clamping arrangement which attaches to the rear axle housing and holds the chassis securely in place. A special axle shaft with an outer end arranged to couple to the dynamometer shaft is slipped into the axle, taking the place of the regular axle shaft, its inner end being splined to slip into the differential just as the regular shaft does. Fifty cars are tested per day.

Previously, the motor and rear axle have been tested separately in their respective assembly departments. The lowest grade of gasoline is used to insure satisfaction under all conditions.

The procedure in giving the chassis its 2 1-2 hour test insures that each speed reduction in the gearbox is satisfactory as well as all other features. The first step is to throw in the reverse, for 15 minutes. The load put on the prony brake is 85 pounds, which corresponds to about 42 horsepower.

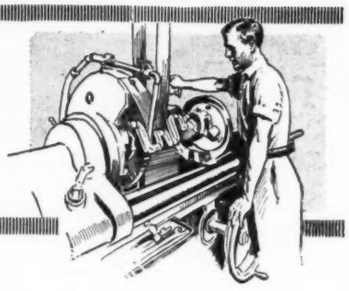
Then the first speed gears are thrown in, and the car operated for 30 minutes pulling about the same load of 42 horsepower. It is next put into second speed and run for an hour. The first 30 minutes of this second speed run the load is light, perhaps around 20 horsepower, while the last half hour is a heavy pull at about 42 horsepower.

Finally comes the run in high gear. This lasts 45 minutes, the load corresponding to a setting of 55 pounds on the brake. This amounts to from 27 to 30 horsepower load.

During these various runs, the testers watch the performance and make any adjustments which are necessary. They look for oil and water leaks, adjust the tappets and the ignition timing and check up the performance of the carbureter. After a rigid inspection the car goes to the paint shop.

Studebaker chassis testing room showing six-cylinder cars undergoing their first trial under load. There is room for nineteen cars at one time in the 300-foot building. Each radiator connects to the circulating water mains which communicate with a tank. The gasoline is also supplied to each chassis from a main pipe

The Rostrum



Reader Describes New Two-Cycle Motor

EDITOR THE AUTOMOBILE:—I have been reading with interest various articles published by you in The Rostrum, referring to two-cycle motors, and would like to get a little information regarding the following:

Since the Elmore and Amplex companies have gone out of business, do any other automobile manufacturers in the United States use a two-cycle motor?

I am very much interested in the development of a two-stroke motor as I am about to receive a patent on one that does not use the crank case as a compression chamber but primarily compresses the charge by a means provided for this purpose on the power stroke of the piston and delivers this charge automatically to a port located in the side of the combustion chamber at or near the top of same, this delivery occurring about the end of the power stroke.

The exhaust port at the base of the explosion chamber is closed by the return of the piston and the inlet port at the top of the explosion chamber is closed by the upward movement of a tube which answers both the purpose of a circular slide valve and a means to convey the primarily compressed charge to the inlet port in the explosion chamber. This tube is provided with expansion wings to prevent the escape of both compressions, that is, the compression in the primary chamber and the compression in the explosion chamber. The tube operates in conjunction with the compression means.

This motor can be used either as a two-stroke or a four-cycle motor. When used as a four-cycle a charge is admitted to the compression chamber only on every other suction stroke, air being taken in each alternate suction stroke. For two-cycle action, gas is admitted every suction stroke. This motor will be positive in action and can be used with a single combustion chamber or it can be used as a unit to make up any number of cylinders desired.

Pittsburgh, Pa. KARL E. DUNBAR.

—The Duryea, made by the Cresson-Morris Co., Eighteenth street and Allegany avenue, Philadelphia, Pa. and the Chase truck manufactured by the Chase Motor Truck Co., Syracuse, N. Y., are the only two makes of note in the United States using the two-cycle motor.

Italian Fiat Co. Makes Two Fours

Editor THE AUTOMOBILE:—1—Please give me a brief description of all Fiat models made at the present time in Turin, Italy, but not made in Poughkeepsie.

2—Please give me the price and mechanical description of Crane cars. How many are made in a year, and by whom?

New Jersey. S. ROEBLING.

—1—Two chassis are now built by the parent Fiat company in Turin, Italy. One is a 20/30 horse power model selling for $3,200, and the other is rated at 30 horsepower and sells for $3,750. The former is strictly a town car chassis and will turn in a 25-foot circle. It has a block motor 3.2 by 5.6 inches, and a pressure oiling system. The magneto is a Bosch and the carbureter is a special Fiat multiple jet type. The clutch is a multiple disk, the gearset has four speeds, and the rear axle is a pressed steel type. The foot brake is a worm-operated contracting type and the hand brake operates internal expanding drums on the rear wheels. The wheelbase is 110 inches and the tread is standard. Equipment includes two multiple-bulb headlights, electric horn, electric starting and lighting, toilet cases, and demountable steel wheels. The price of this chassis fitted with either coupé or landaulet body, is $4,700. The latter is shown in Fig. 1.

The specifications of the 30 horsepower light touring car chassis are much the same, except that the motor measures 4 by 5.5 inches, and the wheelbase is 116 inches, instead of 110. This car, Fig. 2, is priced at $3,750 with touring body.

2—These cars are no longer made.

Car Tracks Versus Cobbles for Economy

Editor THE AUTOMOBILE:—Which is the smaller expense, driving the car on car tracks to save the mechanism, and thereby wearing out tires, or driving the car on cobblestones in order to save the tires, regardless of the mechanism?

Baltimore, Md. ELDRED B. QUARLES, SR.

—This point has never been tested, as far as we know. The motorist should use his judgment in this matter. In some cases, more harm might be done to the car by driving it over rough roads than if the car were run in car tracks to avoid the rough spots.

In other cases it is a question of comfort rather than economy. Many motorists would rather injure their tires a small amount by driving in car tracks than experience the discomfort of rough roads.

How Parabolic Reflectors Are Made

Editor THE AUTOMOBILE:—Will you kindly describe the process or method employed in shaping and polishing the

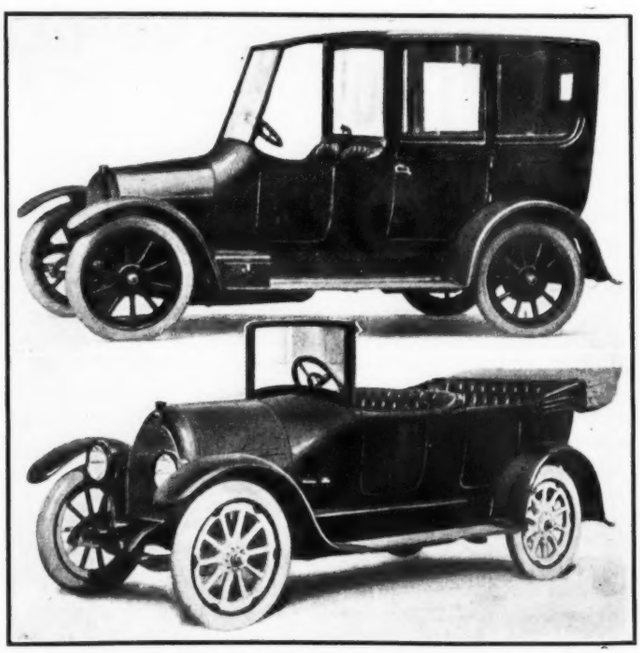


Fig. 1—Upper—Fiat 20/30 horsepower landaulet. Fig. 2—Lower—30 horsepower touring car

best parabolic reflectors such as are used in headlights and searchlights?

2—Is the parabolic form maintained throughout the reflecting surface of the ordinary parabolic automobile headlight?

Pittsburgh, Pa. I. D. W.

—1—According to Gray & Davis, Boston, Mass., parabolic reflectors are manufactured as follows: A special brass is used which gives a very fine surface. This is blanked and formed in hardened steel dies to approximately the shape of a true parabola. Then it is again placed between dies and stamped to give it a perfectly true surface. After this it is ground to a perfect surface, then buffed and finally plated with 99 per cent. pure silver. After plating it is polished.

2—Yes.

How to Calculate Miles Per Hour

Editor THE AUTOMOBILE:—Will you kindly give a simple method of calculating the speed in miles per hour when the time per mile is known?

Newcastle, Ind. E. W. H.

—You may use the formula $M = \frac{3{,}600}{S}$ where M = miles per hour and S = the time per mile in seconds. This formula has been plotted in the form of a curve in Fig. 3.

The derivation of this formula is a simple matter. S represents the time per mile, or another way of saying it is S = seconds per mile. Now, if M = miles per hour, $\frac{M}{3{,}600}$ = miles per second, since there are 3,600 seconds in 1 hour. Therefore, $\frac{3{,}600}{M}$ = seconds per mile, but the seconds per mile is also equal to S. Therefore, $S = \frac{3{,}600}{M}$. It will be noted that the expression per, in the above derivation is merely a division sign. Seconds per mile may be written seconds ÷ miles, or $\frac{\text{seconds}}{\text{miles}}$; miles per hour may be written miles ÷ hours, or $\frac{\text{miles}}{\text{hours}}$, etc. An understanding of this point will make the above derivation clear.

Dirt Causes Miss at High Speeds

Editor THE AUTOMOBILE:—As an interested reader of your Rostrum I would like to ask you for some information that I seem to be unable to obtain elsewhere.

1—I have a 1914 ——— and have had a lot of minor trouble with it. At present I find that at low speeds it runs smoothly and with ample power, but if I try and rush a hill, attaining a speed of over 30 miles per hour the motor begins to miss frightfully until it will at last stop altogether. The miss seems to start on one cylinder, increasing to three. The same seems to occur when I run at high speed on the level. A Mayer carbureter is used with Atwater-Kent ignition. The timing seems to be right and the carbureter is adjustable from the dash, so that is all right. I know the gasoline line is clean, and have a hot air attachment to the air intake. What is the trouble?

2—Exclusive of the Chicago Auto Painting Co., who would make a coupé body for this car, which is a runabout?

3—What would be the best way in which to strengthen the engine bed? I find that the motor rocks violently when pulling hard. The bolts holding it to the bed are tight and the bed vibrates with it.

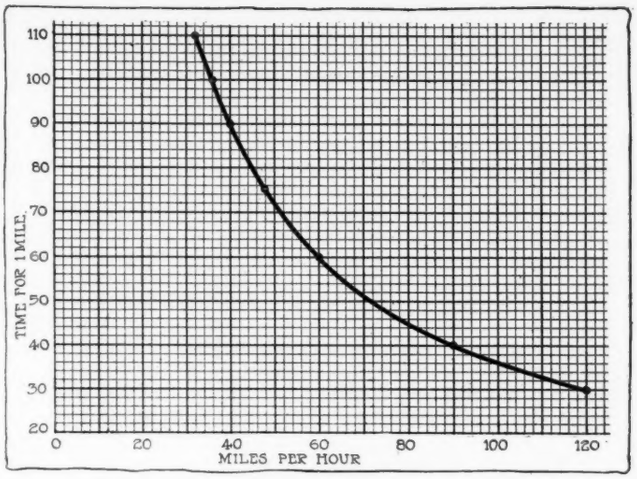


Fig. 3—Curve showing relation of miles per hour and time per mile

4—The water circulation seems to be defective. After running but a short distance the water becomes steaming hot. This occurs before I have gone a mile. If the distance is very far the water boils. The cylinders are clean and the timing is correct. I have flushed out both the radiator and engine, so there is no stoppage. Can you suggest any way of correcting this trouble?

Orange, N. J. M. S. BALDWIN.

—1—Notwithstanding what you say it would seem that the missing was due to dirt in the gasoline line. The obstruction does not block the line entirely, but enough to prevent an adequate supply of fuel being given to the motor at all except low speeds—hence the missing above 30 miles per hour. Disconnect the gasoline line at the carbureter, and allow the gasoline to run out. If it does not flow freely clean the pipe and outlet from the gasoline tank.

2—Any body making concern will build a body to order for this car.

Hard to Strengthen Bed

3—It is next to impossible to strengthen the engine bed without putting in a new crankcase. Possibly your trouble is due to allowing the motor to pull too hard. When it begins to labor on a hill, shift to low gear. Do not strain the motor by allowing it to work under these conditions.

4—If the timing is correct and the water passages are free there is no reason why the water should boil unless the mixture is too rich or the cylinders are carbonized. Examine the timing and the carbureter adjustment once more, then inspect the cylinders to see whether they are carbonized, and look at the passageways to see that they are not clogged. Even if the radiator is free from obstructions and the hose connections are clear, there may be dirt or sand in the water jackets. Lastly, make sure that water is not being lost, either by leakage or by flowing out through the radiator vent pipe. Sometimes the vent opening is placed low, with the result that the water splashes out until enough has been lost to prevent proper cooling. To keep the water from boiling, the radiator must be full or nearly full at all times. A shortage of water reduces the amount of cooling, and when the level of water drops below the top of the return connection to the radiator, circulation stops entirely.

Six as Fast as Four

Editor THE AUTOMOBILE:—Please explain in the Rostrum why it is that a six-cylinder car will run faster than a four. It is a general impression among people not very familiar with cars that a six is faster, but you never have heard of a six-cylinder car winning a big race.

Greensboro, N. C. E. C. KING.

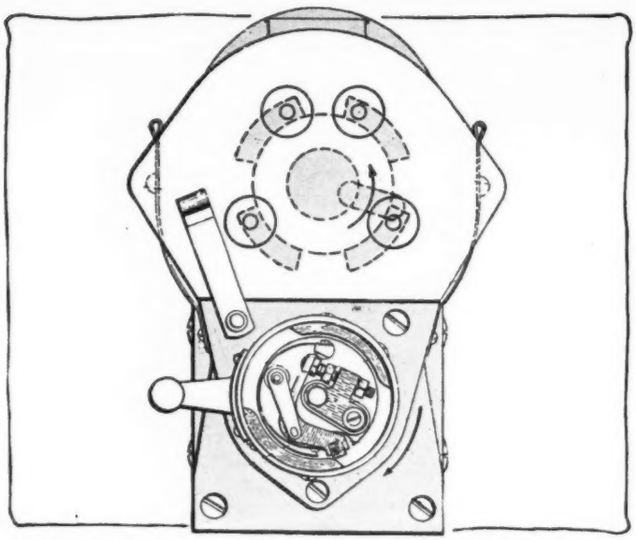


Fig. 4—Bosch DU 4 magneto showing setting for anti-clockwise rotation

—The number of cylinders has very little to do with the speed. One-cylinder cars have done considerably over 70 miles per hour, while twelve-cylinder machines have traveled about 2 miles per minute. So far as the motor is concerned, the speed of the car depends on the power the motor develops, and the number of cylinders influences this only indirectly. If it takes 60 horsepower to drive a car 70 miles per hour it does not matter much how many cylinders the motor has as long as the requisite power is supplied.

Contrary to your statement, six-cylinder cars have won some big races, although four-cylinder machines have won the majority of races, principally because the four-cylinder type preponderates.

Four-cylinder motors have generally been preferred for racing to motors with more cylinders because they are less complicated and there are fewer parts to get out of order, and because few of the advantages of the six which are evident in touring car work have weight in designing racing cars. The six has a smoother torque, less vibration at low speeds, and is more flexible than the four, but as racing motors operate at excessive speeds these points are of no advantage.

How to Change Magneto Rotation

Editor THE AUTOMOBILE:—1—I have a Bosch high-tension magneto, D.U.-4, which runs clockwise, and I would like to reverse it so it will run anti-clockwise. Will I have to send it to the Bosch factory to make this change, or can I do it myself?

2—Please give me details on timing model 27, 1910 Peerless motor.

Huntington, W. Va. W. D. A.

—1—You may do the work yourself, although it would be better to send the magneto to the Bosch factory. The present breaker will have to be changed for an anti-clockwise one and the relation between the armature and distributer shafts will need to be readjusted. In case you do the work yourself, after you have put the new breaker in place, with the spark advanced all the way and the points just ready to separate, set the distributer gear so that from one-half to two-thirds of the width of the distributer brush is still on one of the distributer segments. This relation is shown in Fig. 4, the arrows showing the direction of rotation. This setting is exactly opposite to that for clockwise rotation.

2—You do not state whether you mean the timing of the valves or the magneto. The setting of the former is easily done according to the marks on the flywheel, so that it is probable that you mean the latter.

With the spark retarded all the way, bring the number one cylinder to dead center on the compression stroke, as indicated by the center mark for cylinders 1 and 4 on the flywheel. Then set the armature of the magneto so that the breaker points are just ready to separate.

How to Apply a Cone Clutch Facing

Editor THE AUTOMOBILE:—I have a leather faced cone clutch and wish to put on a new leather one. I want to know the best kind of leather I can get to put on there. I also want a little information concerning the putting on of the leather. I thought perhaps asbestos would be better than leather, and would like to have your opinion on this matter.

Kutztown, Pa. J. F. ANGSTADT.

—Either leather or an asbestos fabric may be used with satisfaction. If you use leather you should obtain friction leather, which is made for this purpose. This may be purchased at any supply store or the following concerns, taken from the Automobile Trade Directory: Chicago Belting Co., 113 N. Green street, Chicago, Ill.; Detroit Leather Specialty Co., 275 Beecher avenue, Detroit, Mich.; Hide, Leather and Belting Co., Indianapolis, Ind.

In ordering the facing the diameters of the two edges of the cone and the width of the cone should be given. If an asbestos fabric is used, care should be taken to obtain a piece that is made for the size of cone you have. Unlike leather, strips of this material to fit cannot be cut from a large piece of fabric.

The thickness of the facing is important because too thick a facing will prevent the cone from properly entering the flywheel. One-quarter inch is an average value.

If you desire to buy a piece of leather and cut your own facing you should remove the old clutch leather carefully and use it for a pattern. Another method is to wrap a strip of paper around the face and make a pattern from it.

Before applying the leather it is well to soak it in a neatsfoot oil to soften it.

Care should be taken to cut the strip of leather to the correct length. The best way is to first rivet one end and then wrap the leather around the cone in such a manner that it slips down over the smaller end of the cone as shown in Fig. 5. Then pull it tight and rivet the other end. Now push the leather up in place all around and it should be tight and unwrinkled. If an attempt is made to apply the facing by attaching the leather to one end only, there is danger of it wrinkling, especially if the leather is not of even thickness. Any unevenness may be removed by truing in a lathe but if the leather is properly put on this should not be necessary.

The same advice applies to putting on an asbestos fabric, but there is less danger of the facing wrinkling.

Special copper rivets designed for riveting leather should be used. These have broad flat heads of medium thickness as shown in Fig. 6. Rivet holes should be cut in the leather and these should be countersunk, as shown. Riveting will be facilitated if a bolt the same diameter as the rivet head is used as a support, as shown in this figure. The round end of the bolt forces the head of the rivet into the countersunk hole and makes a good fit.

80 Per Cent. of Motors Block Cast

Editor THE AUTOMOBILE:—1—How many manufacturers are making motors with cylinders cast separately, and how many are making motors cast en-block?

2—Which are the best and why are they the best?

3—What kind of roller bearings would you recommend as the best?

4—Which style of valves would you recommend as the best for service and silence in the life of a motor, and why would you recommend that kind?

5—What type of rear axle would you say was the most durable and accessible for the ordinary man to use, and also the safest, and why is it the best?

6—Where would you consider the proper place for a gasoline tank.

Bridgetown, N. J. E. R. K.

—1—Considering only the principal makers, the methods of casting the cylinders employed by them is given in the following table:

Type of casting	Percentage
Six cylinders in a block	15.1
Six cylinders cast in threes	17.2
Six cylinders, cast in pairs	16.4
Six cylinders cast singly	1.3
Four cylinders cast in a block	24.7
Four cylinders cast in pairs	22.2
Four cylinders cast singly	3.1

2—What is best under one set of conditions may not be so under a different set. It is impossible to say that a given type of casting is best without restriction. This is proved by the fact that all types of castings are still in use. However, from the above figures it will be noted that the block casting is by far the most popular 15.1 per cent. of the sixes and 24.7 per cent. of the fours being of this type, the total being approximately 40 per cent. The advantages advanced in favor of this type are that it gives a simpler casting, is cheaper to manufacture, is more rigid, and gives the motor a simpler exterior because a large amount of piping is done away with. Against this type it is urged that in case a casting proves defective the loss is greater, two men are required to remove or replace the cylinder block, and should a cylinder become cracked through the freezing of the cooling water, it is necessary to put in four or six new cylinders, as the case may be, instead of one or more if the cylinders are cast singly or in pairs. The advocates of the block method of casting meet these objections with the argument that these faults are actually small in practice.

3—It is impossible to answer questions of this character. As has been said many times before, in order for us to state, with fairness, what make of bearing is best, we would be obliged to test every make of roller bearing on the market exhaustively. In matters such as these we cannot rely on the statements of others because they are liable to be biased. Obviously it is impossible for us to test all makes of bearings.

Each type has its advantages, and by study you can determine the one most suitable under a given set of conditions. In some places adjustable bearings are indispensable, while in others they are not so necessary. Sometimes the decision depends on the price rather than on the quality.

4—Any well-designed poppet or sleeve valve will give good service. It is generally considered that the sleeve valve is slightly quieter than the best designs of poppet valve motors. This difference is small, however, in the best motors of each type. Valve-in-head motors are generally more powerful than the other poppet types, but the mechanism is slightly more complicated.

5—Everything else being the same the durability of the axle is not greatly affected by the type, whether floating, semi-floating, three-quarter floating, etc. The floating axle is somewhat easier to take apart than the other types, but this is a small matter because the axle should not require taking apart very often. From a safety standpoint all are about equal.

6—This depends on conditions; there are advantages in every location. If placed under the cowl, the gasoline can flow by gravity to the carbureter, yet the carbureter does not need to be placed as low as when the tank is under the seat. By locating the carbureter higher, it is more accessible and the intake pipe is shortened, giving better carburetion. The gasoline is warmed by the heat of the motor so that in cold weather, at least, carburetion is facilitated.

The under-seat location of the tank also allows fuel feed by the simple gravity method, but there is danger of the flow stopping when climbing a steep hill. When the tank is being filled, the passengers in the front must be disturbed.

Putting the tank at the rear utilizes otherwise waste space and allows the space under the front seat and under the cowl to be used for other purposes. There is a slight objection to this location, however, because the gasoline must be fed to the carbureter either by pressure or the vacuum system. This means a slight amount of complication, but it is not serious as is indicated by the fact that the majority of cars now use one or the other of these systems.

Net Weights of Various Cars

Editor THE AUTOMOBILE:—Will you please state the weights of the following cars: Saxon, Chalmers, Overland, Metz, Ford, Maxwell, and Studebaker?

Jamestown, Mo. R. H.

—The weights of the different models of the makes you mention are given below. The figures are those claimed by the manufacturers and are with tanks empty.

Saxon	1,150	Overland, 81	2,600
Chalmers Master Six, five-pass. touring	3,935	Metz	1,150
Chalmers Master Six, six-pass. touring	4,046	Ford, roadster	1,395
Chalmers Master Six, torpedo.	3,928	Ford, touring car	1,510
Chalmers Master Six, roadster	3,792	Maxwell, roadster	1,800
Chalmers Master Six, limousine	4,439	Maxwell, touring car	1,820
Chalmers Master Six, coupé	3,996	Studebaker Six, five-pass. touring	2,865
Chalmers Little Six, five-pass. touring	3,534	Studebaker Six, seven-pass. touring	2,930
Chalmers Little Six, couplette.	3,522	Studebaker Four, three-pass. roadster	2,350
Overland, 80	2,900	Studebaker Four, five-pass. touring	2,425

Ward Leonard Makes Starters

In THE AUTOMOBILE for October 29 on page 805, in giving a list of various starters which might be used on a model 25 Buick, the starter made by the Ward Leonard Electric Co., Bronxville, N. Y., was omitted.

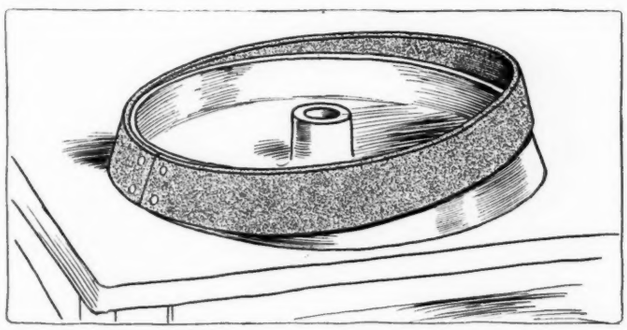


Fig. 5—Method of working clutch leather on to the cone after both ends have been riveted

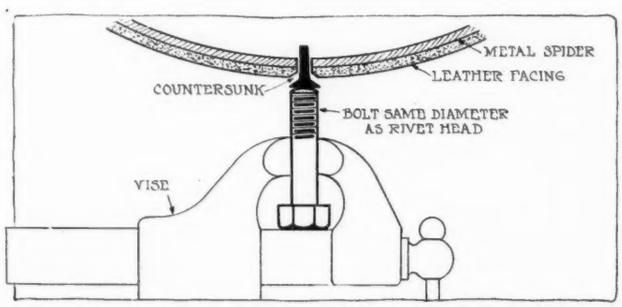


Fig. 6—Use of a bolt to countersink the rivets into the holes in the leather

The Engineering Digest

Power Testing Apparatus by Which Incidental Resistances are Obviated and First Readings are Final

WHEN automobile and aviation motors are to be tested for brake horsepower at the Royal Technical College at Breslau, Germany, they are now mounted in a pendulum frame which has been designed and built at the laboratory of the institution, and the reaction of the frame upon a balance beam device serves for measuring the forces applied, in a manner which has been found accurate and convenient.

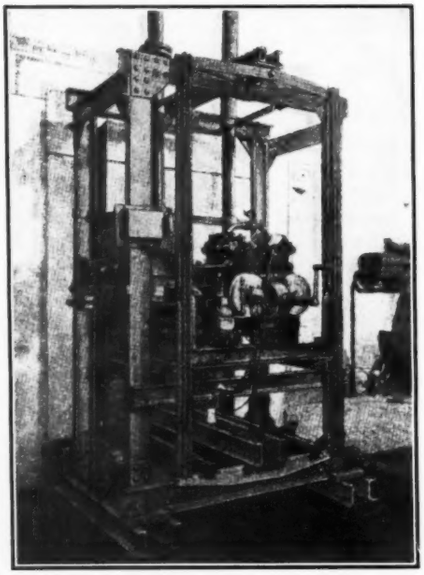


Fig. 1—The Breslau pendulum testing stand with motor mounted in it

The very brief description of this apparatus furnished by Professor Baer of Breslau is amplified by the accompanying illustrations, Figs. 1 to 5, on which the principal dimensions are marked in millimeters. Fig. 1 gives a general view of the arrangement, with an air-cooled motor mounted for testing.

The deformable, motor-supporting cage suspended in the channel-iron stand consists in the essential features of two vertical frames, one at each side of the motor—which hangs upon a special cradle or barrow between them—both resting upon a rocker frame at the bottom, which acts as two pairs of parallel crankarms to receive motion from one or the other of the vertical frames, and the movement is guided by a rocker frame at the top. Fig. 2 shows details of the vertical frames and Fig. 3 those of the rigid lower rocker frame which supports them and is actuated by them when the motor is working.

The lower supports, which take up the motor power and the weight, are provided with knife-edge bearings, designed as shown in the left portion of Fig. 4, while the upper ones which only guide the action and transmit no power have ball bearings. The rocking motion of the supporting-frame also takes place upon a knife-edge bearing under the middle of it. The cradle which carries the motor (in some cases placed upon an intermediate rubber mat to absorb vibration) is hung by means of hook-shaped hangers with knife edges in pans secured in the struts of the vertical frames, on the plan shown to the right in Fig. 4.

The motor is so placed in this hanging cradle that the crankshaft extends horizontally in the middle plane between the two pairs of knife-edge bearings of the hangers and at the same level; this having the effect that the motorshaft remains quiet at small movements of the cage.

By means of special compensatory weights the center of gravity of the unit comprising the motor and its cradle can be displaced along the axis of the shaft in order to obviate the influence of unequal weight distribution, but, as an elaborate compensation by this means is in many instances unnecessary, other slidable compensation weights are provided in sufficient variety on both of the balance beams at the sides of the cage, and these weights can be more readily used to offset approximately any unequal weight distribution which might cause twisting and resistance in the ball bearings at the top of the cage.

The load for the motor is produced by a fan dynamometer brake, and this is operated inside of a strong and broad wooden casing (to help in equalizing the atmospheric conditions for any series of tests) and is calculated to give a 12-horsepower resistance at 1,500 revolutions per minute.

The torque developed by the motor reacts against the

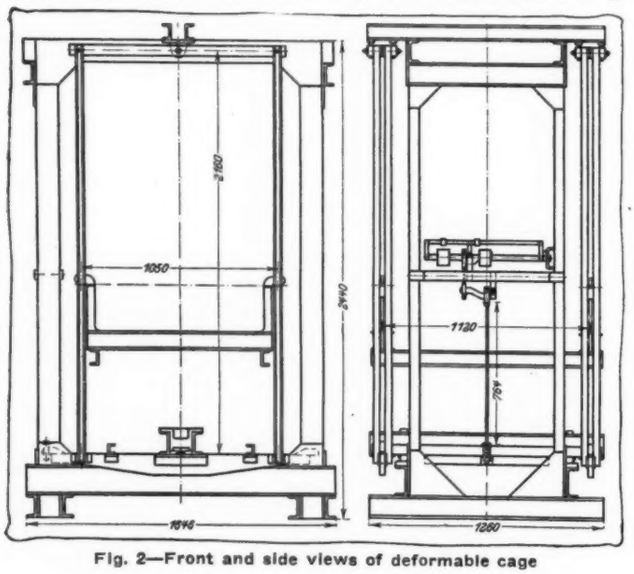


Fig. 2—Front and side views of deformable cage

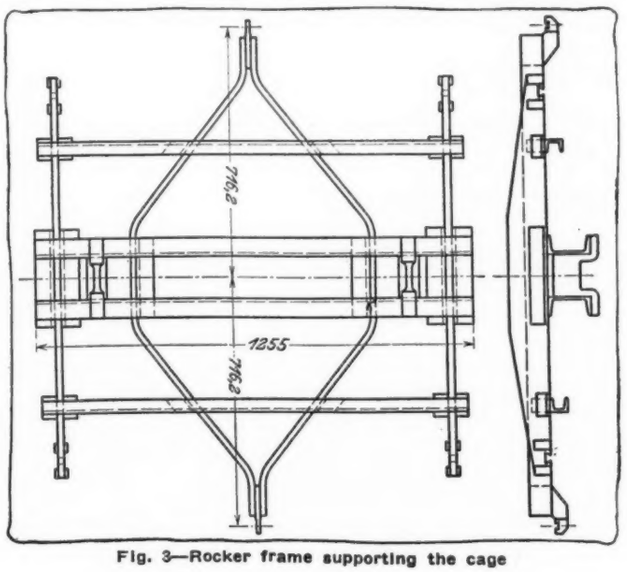


Fig. 3—Rocker frame supporting the cage

cradle and from the latter is transmitted to the vertical struts and from these to the lower rocking frame. By means of tension rods—see Fig. 2—which are disposed at a distance of 716.2 millimeters at both sides from the central vertical plane of the apparatus, the torque is carried to one or the other (according to the sense in which the motor turns) of the two balance beams. Their construction is indicated in Fig. 5. Here the force is measured which balances, at a distance of 716.2 millimeters from the motorshaft axis, against the torque developed.

The unavoidable small oscillations and vibrations are absorbed in a little hydraulic dashpot, which is operated with

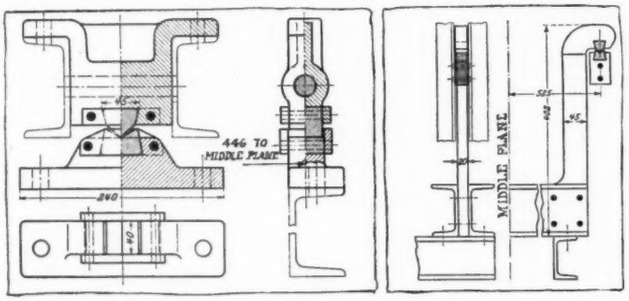


Fig. 4—Knife-edge bearings for cage and motor cradle

water but patterned after those used with oil for the regulation of centrifugal governors.

The feed pipes for fuel and lubricant are made of very flexible copper tube and the cooling-water is taken to and from the separately mounted radiator by flexible rubber hose. [Near the equilibrium, where the final measurements are taken, the resistance represented by these flexions are of course almost nil, if the original arrangement of the tubes is

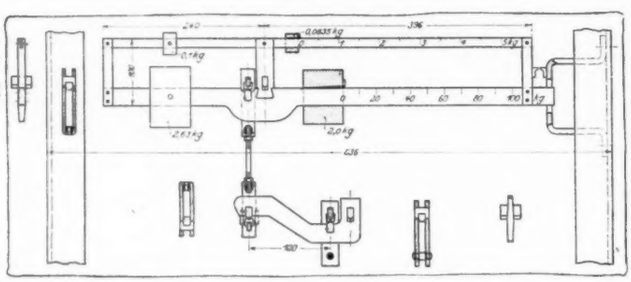


Fig. 5—Balance beam operated by rod from arms of rocker frame

made for this position.] The fuel consumption is measured by using a tank placed on a balancing scale and ascertaining the weight of the fuel used for a given time with a constant motor load, in the manner now widely adopted. A special device for measuring all the air consumed is also on hand at the institution. From *Zeitschrift des Vereines Deutscher Ingenieure*, September 12.

Special War Service Provided for German Motor Engineers

WITH a view to providing rapid solutions of engineering problems arising during the course of the German war for world domination, the Verein Deutscher Ingenieure (Society of German Engineers) has arranged a Central Shop for Engineering Work in the society's building in Berlin, where all members not subject to field service may work on assignments. Each of them must first send detailed information of the working field in which he has special experience.

A volunteer motor boat corps is also organized for river service. Former naval officers who are incapacitated for other work and graduated engineers are to command the boats.

Control of Materials and Dimensions in German Manufacture of Steel Balls and Ball Bearings

(Continued from last week)

THE apparatus arranged in the room for the testing of finished bearings serves a number of different purposes: (1) To try out the current manufacture; from time to time bearings are taken at random from the supply on hand and are tried under severe conditions for their reliability in all their functions; (2) to enlarge the scientific foundation for the construction of ball bearings; (3) to try out the manner of mounting and operating the bearings in mechanisms of widely different purposes, with imitation of such features in practical operating conditions as dust, humidity, high temperatures; (4) to try new designs in the field of parallel, roller and ball bearings; (5) to try ball bearing materials, and (6) for making tests to order for the authorities or industrial institutions.

The scope of the department is perhaps best made clear by mentioning some of the test results.

A No. 306 bearing with a brass ball cage lined with white metal was lubricated with a few drops of oil and then run for five months without further lubrication at 1,500 revolutions per minute and under the maximum load for this speed, 220 kilograms, running 12.5 hours daily or a total of 1,579 hours. At the end of this time the bearing had to be dismounted, as the inner race began to suffer from lack of lubricant, but the cage, the balls and the outer race remained uninjured.

Annular Bearings for Bicycles

The use of three-point ball bearings with adjustable cones has survived in bicycles until the present day. It was attempted, to be sure, after the first successful introduction of annular bearings in automobiles to apply this simpler type to bicycles as well, but errors in design and mounting combined with insufficient protection against dust and humidity led to unsatisfactory results. To remedy this situation, however, the D. W. F. firm three years ago brought out complete bicycle hubs in which annular bearings, supplemented by end-thrust bearings, are effectively protected against dust, water and loss of lubricant as well as against the pinching and warping of the bearing rings to which the light cycle construction has been especially liable. To test the new construction in comparison with the so-called cone bearings (meaning the adjustable ball bearings) the following arrangements were made: The same bicycle was successively fitted with the cone bearings and with the new annular bearings and in each condition was tried with and without load. The provisions were to some extent typical of the variety of facilities required for measuring the fitness of any given style of bearings for any one of its uses.

The bicycle was placed with its rear wheel on two wooden sheaves arranged tandem, and these were turned with a slightly concave circumference; the front wheel was supported on a broad and flat-rimmed wooden sheave. The place of the crankarms was taken by wood pulleys driven by belting from a jackshaft underneath, and the front wheel was likewise belt-driven from one of the sheaves driving the rear wheel, and the whole complex of pulleys was actuated, also by belt, from a direct-current electric motor of 1.9 horsepower. With all shafts mounted in ball bearings and the use of very thin and non-slipping belts the power consumption in the stand was small. The current consumption of the motor was measured with Weston meters and the rotary speed of the crankshaft with a tachometer made by Morell at Leipsic. The motor was run for one hour or until the current consumption became constant for a given load, and readings for the test arrangement were then taken for ten minutes with

intervals of a half minute. From the results was to be deducted the resistance of the apparatus, varying with the load. To determine this resistance the bicycle was taken off and in its place a shaft with a brake disk was mounted in its place exactly where the crankshaft was before; from this prony readings were taken.

[The author gives the numerical values of the readings and diagrams drawn in accordance with the same, showing that the efficiency of the two bearings, measured in proportion to the power consumption in each case, varies materially. The figures show a superiority of the annular bearing of 49.7 per cent. without load and 28.6 per cent. under load of 86 kilograms.]

Examination of Injured Bearings

Among the causes resulting in injured bearings, with regard to which complaints are sometimes made and which therefore may call for examination at the factory, the most important are (1) ovalizing due to radial pinching, (2) excessive end-thrusts, (3) dust, grit or moisture in the housing and (4) acid lubricants.

Ovalization of the outer race occurs most frequently where the housing of the bearing is made in two or more pieces, usually bolted together, and not quite circular. The balls are in such cases overloaded every time they come to one of the two diametrically opposite places where the diameter is smallest, and the result is that the ball path in the outer races shows rough abrasions in just these places. Measuring reveals no fault, as the race when dismounted springs back to its original form, but the symmetrical locations of the injury furnish sufficient indication of the cause.

Excessive end-thrusts may take effect upon the balls first, but as a rule are recognized by lesions along the whole circumference in the ball paths of both inner and outer race.

If a bearing in its mounting is not protected against the admission of dust and grit, the surface of the balls and of the paths soon get a mat instead of a polished appearance by the grinding action and after a while radial play can be observed between the two races and the balls. A frequent cause of this trouble, in the case of bearings in gearboxes, is that emery powder is used for running the gears in, with the ball bearings in their place. Rust spots due to the admission of moisture may have disappeared together with their cause, the rust being worn off entirely by the movement of the bearing, but in that case small pinholes in the races and on the balls, where the rust has been, always betray that moisture has been at work.

The effect of acid lubricants is seen in the form of many but shallow scars on both balls and races remaining as the indelible marks of the corrosion to which they have been subjected.

Saving of 7 Per Cent. of Trucks' Time

(*Continued from page* 892.)

utes for inward freight and 4 minutes for outward freight. The delays were chiefly at the rush periods. It is doubtful whether any reduction could be made here.

This time might be reduced from 8 to 3 minutes by avoiding errors in the delivery checks; by having them made out and filed at the cashier's office almost simultaneously with the placing of the freight.

To overcome this trouble one road put on sorting gangs, the result being not only a reduction in time, but also giving more space to the unloading of the cars and preventing consignments from being hidden by freight arriving subsequently.

Loading or Unloading

A reduction of 15 per cent. might be made under this heading by closer cooperation between the employees of the railroad and the truck drivers. The employment of more truckmen in the freight house to assist the drivers in handling the more bulky loads would also help.

It is questionable whether the saving in the driver's time which would result from the use of the sill or single dump delivery would justify the necessary increase in labor cost by these methods.

Loafing is not chargeable to the railroads, and depends almost wholly on the season of the year.

Moving in Freight Yard

Where the buildings are near together and the pavements in fair condition this item is negligible. However, a saving of 10 per cent. might be made by improving the pavements.

It will be noted that the total possible reduction in the saving of the teamster's time as represented in this table is 18 per cent., or between one-fifth and one-sixth of the total time spent in the yards. Since the wagons spend one-third of the day in the yards, the total saving would be between 6 and 7 per cent.

Chicago Police Fighting Muffler Cutouts

CHICAGO, ILL., Nov. 6—The Chicago police have started a vigorous campaign to eliminate the cutout nuisance, adopting new tactics by making arrests in the case of cars fitted with cutouts operated from the seat. Arrests are made even when the cutout is not being operated. The very fact that the car has a cutout which can be operated from the seat is taken as evidence and arrests follow. So far about forty motorists have been apprehended for having their cars so equipped.

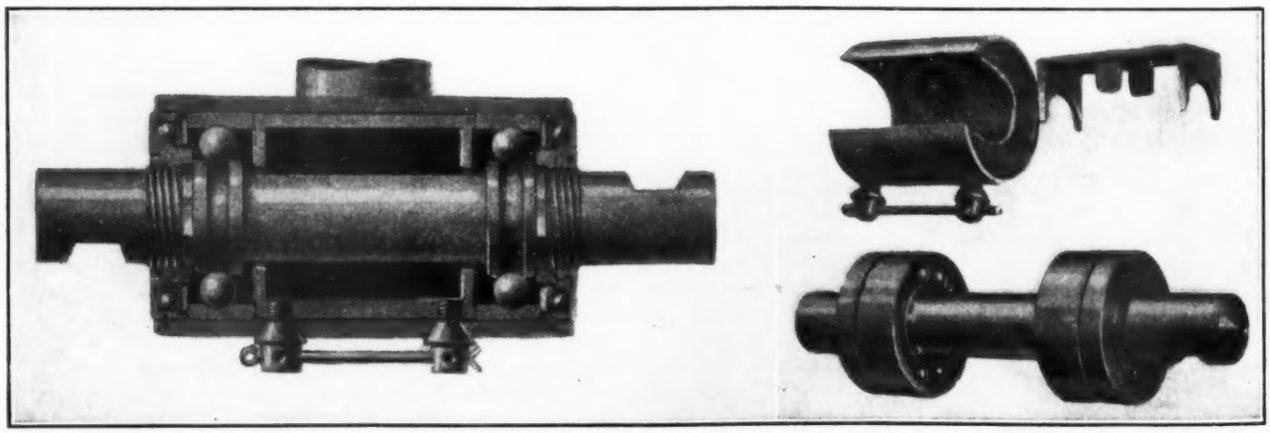


Fig. 7 (Figs. 1 to 6 last week)—Annular ball bearings in bicycle crankhanger, showing method found necessary for protecting an annular bearing against dust and moisture

Requirements Should Determine Weight of Automobile Parts

Durability and Weight Are Inseparable—Comfort a Factor—Dangers of Too Light Construction

By George W. Dunham
Consulting Engineer, Chalmers Motor Co.

PROMINENT among those points most generally discussed during the present season, regarding the different phases of automobile construction, has been weight. Weight in a motor car should be scientifically determined according to the work to be done by each part.

Always Some Trouble

The manufacturer of any article, if honest with himself, realizes that there is always a certain percentage of trouble experienced with his output, and that this percentage of trouble can be reduced only to the absolute minimum but never wholly eliminated. With our company, when three cases of a specific trouble have been reported, even though there are only three cases out of thousands of cars in service, thorough investigations are started immediately and often thousands of dollars are spent to insure that there will not be a continuation of this trouble, and that this happening was only due to chance or what is known in manufacturing as "percentage of error."

It is obvious that the more the margin of safety throughout the car is reduced, the greater the percentage of troubles is bound to be. It is also obvious that the lighter the construction, the lower the factor of safety must be.

Two other points must also be considered in determining weight. One, if a trouble should occur, will it endanger the life of the occupants, or will it merely impair the quality of the car? For instance, if a wheel breaks, some one is liable to be hurt, whereas, if the bearings in the parts supporting the springs are so small that they will wear readily and rattle soon, this is a feature that will lessen the quality of the car, but not endanger the occupants.

Second, how far shall the comfort of the passengers be considered?

The first point—safety—is by far the more important. Our steering gear could be made considerably lighter, but we consider it would be cutting too close to the danger point. Our wheels could be cut down to thinner spoke sections and lighter felloes. Here again, we would fear a percentage of broken wheels. Our axles could be lightened considerably, but we would not want to take the responsibility of the danger which might result from breakage.

In some cars the torque tube has been eliminated, which effects a considerable saving in weight but throws the entire burden of the driving mechanism into the springs. Our six is provided with a concentric torque tube. Its purpose is to hold the rear axle in the proper alignment; to relieve the springs of all work but that of supporting the car. Its advantage is apparent through the manner in which the car holds the road at various speeds, and the absence of it is shown in most cases by a car dancing and hopping when going over rough roads, cobblestones and rutted roads. The use of a torque tube practically eliminates chattering or jumping of the rear axle, when pulling in heavy sand, mud or snow.

In considering the second kind of trouble resulting from too light weight—that which reduces the efficiency and quality of a car—there are many things to be considered. Almost invariably on the excessively light cars the sheet metal used in the body, fenders, dust shield, bonnet, etc., is cut to the limit. The result is a finish which is wavy and rough; with extremely light material it is impossible to keep the paint on the bodies and the enamel on the metal work gives trouble. Another bad result of too light materials is that they soon loosen and rattle. Quite often body bracings or frame members are so lined that the panels of the body sag and wrinkle.

Comfort a Factor

The third factor in considering weight is comfort. Weight is saved on some cars by the use of small inadequate fenders, for instance, which do not properly protect the occupants of the car from flying dirt. Very frequently the size of the windshield is cut down so that a small standard size of glass can be used, saving both weight and expense, but also giving less protection to those in the car.

In the auxiliary seats many designers, probably figuring that these seats are seldom used, reduce their size until they are positively uncomfortable.

Durability Means Weight

In building a car which is best suited to the policy of building a maximum car it is not very difficult to decide which course to follow. The best car for the purpose means that it must possess some definite qualities—first, maximum safety; second, comfort, and third, stability.

Contrary to the belief of some, the extra weight which is really insurance against frequent rattles and breakages, does not increase maintenance costs. By accurate tests under normal conditions it has been proved that two cars of the same approximate size and power, one weighing considerably less than the other, consume the same amount of gasoline. In actual road work we have found that the lighter car will use as much and under some conditions slightly more fuel than the heavier car. This is true because where stability of design has been neglected it almost invariably follows that motor and carbureter efficiency have not been brought up to the highest basis. A further, and perhaps the fundamental, reason why two cars of widely varying weight burn equal amounts of gasoline is that the heavier construction means better alignment of the moving parts throughout the car and therefore less loss of power due to friction. The heavier car is almost always an easier rolling car. It clings better to the road and therefore wastes less fuel.

$15 Extra per Year

For the sake of argument, however, let us suppose that between two cars of the same approximate horsepower and size, the heavier does burn more gasoline. Experience proves that in 10,000 miles of driving, the extra cost of the gasoline burned in the heavier car would amount to only $10 to $15. In other words, in a year or year and a half of driving you would have to spend not more than $15 extra for gasoline to insure yourself a car which is always comfortable, always safe, and which gives the minimum amount of trouble.

Trade Opportunities Abroad

Consuls in Sweden, Africa, Asia and South America Report Business Openings

THAT the demand for the American automobile and motor truck in South America, Asia and South Africa is growing, is manifested by the recent reports on trade opportunities from the consuls in those respective territories. Many of these contain requests for information regarding the establishment of agencies for automobiles and accessories, while others are interested in the establishment of motor truck service. There seems to be a large demand for accessories and a fair one for trucks.

Americans have not attempted to enter the market for motor trucks in Turkey. Most of the trucks so far sold have been bought by the Army and it was reported that the Ministry of War would soon be prepared to receive bids and try cars submitted as samples with a view to purchasing 100 motor vehicles of various sorts. The trucks previously purchased have had a capacity of 2 to 5 tons and of 10 tons.

Reports from Swedish and Italian consuls have also been sent in. These requests are for the handling of American cars and accessories. Most of the consuls state, however, that the establishment of American agencies in these countries and the success of the enterprises there, would depend mostly on the keeping of the cars in stock, with repair parts.

The following trade opportunities give a brief outline as to just what is wanted. Those interested may get complete information by applying at the Bureau of Foreign and Domestic Commerce, Washington, D. C. The numbers given should be referred to when writing to the bureau.

13556. Small Cars.—A responsible South African business man wishes to secure agency rights for an American small car, suitable for that country. The car must be right-hand drive, good clearance, and moderate in price. An American consul writes that manufacturers should give complete description, with particulars as to prices, discounts, factory output, testimonials from users, and South African territory available. Also state if trial car could be shipped immediately, if the firm considered the proposition favorably.

13558. Motor-car and Motor-cycle Accessories.—A South African firm doing a good business in sporting goods, motorcycles, cycles, etc., with good up-country connections, is just opening a separate department handling accessories for motor cars, motor cycles and cycles. An American consul states that the firm will carry a very extensive stock and desires catalogues, price lists, and all available literature along these lines.

13582. Motor Vehicles.—An American consular officer in Sweden reports that an engineering firm in that country would like to communicate with American manufacturers of motor cars, motor trucks and motor cycles not already represented in that country, with a view to representation and selling types suitable for the market. Motor cars and trucks should be of 25 to 50 horsepower, strong and able to stand traffic on rough roads.

13587. Motor Trucks and Other American Goods.—An American consul reports that an American citizen, who has been residing in the East Indies for several years, was leaving for New York to represent a number of Singhalese and Tamil merchants who wish to do business with American exporters to the Far East. He is especially interested in motor trucks, but is also desirous of meeting exporters of other lines of eastern trade.

13592. Electric Van or Truck and Runabout.—A municipal electrical engineer in South Africa would like prices and details forwarded for one Edison battery electrical van or truck, carrying 4,000 pounds, capable of ascending an incline of 1 in 8, or 12 1-2 per cent. and a speed on level ground of 10 to 12 miles per hour. Prices are desired for chassis only and for completed car landed at a certain South African port. Specifications should indicate full mileage for each battery charge, assuming one-half distance with full load and the other half light. Quotations are also desired for an electric runabout capable of carrying four persons. Edison batteries are desired. Prices quoted should be for complete car with accessories. The same standard voltage for both vehicles would be considered an advantage.

13599. Motor Vehicles.—An American consul in Sweden has transmitted the name of a firm in his district which desires to be placed in touch with American manufacturers of motor vehicles.

13610. Motor Vehicles.—A report from an American consul in Asia states that inquiries have been received at the consulate relative to the possibility of purchasing an American automobile with which to inaugurate a passenger service between two points. It is intended to purchase more cars if the service can be operated successfully. American manufacturers interested are requested to send advertising literature to the persons named in the report.

13631. Motor Trucks.—An American consul telegraphs from one of the European countries stating that an American located in his district desires prices immediately from reliable manufacturers in the United States for all available 1 to 3 ton motor trucks, delivered. Prices should be cabled to the address given in the report.

13808.—Automobiles and Accessories.—A large firm in a European country has reported to an American consular officer that it wishes to buy small automobiles to sell from $500 to $1,000 each; also tires and accessories are desired. The firm pays cash f.o.b. vessel. Correspondence may be in English.

13925. Automobiles and Accessories.—A firm in southern Europe has advised an American consul that it desires to represent American makers of and dealers in low-priced automobiles and accessories. It is explained that the firm believes there is an excellent demand provided the cars can be kept in stock with repair parts. Cars selling for less than $1,000 are desired. Catalogues and correspondence should be in Spanish or French.

14005. Magnetos and Spark Plugs.—A firm of aeroplane builders in the Near East, which states it is in a position to offer the best of references, has informed an American consular officer that it buys magnetos and spark plugs. Correspondence should be in English.

14118. Automobiles.—An American consular officer in Latin America transmits the name and address of a firm in his district which is desirous of getting into touch with American manufacturers and exporters with a view of representing them on a commission basis. The firm is interested in the following lines: Automobiles and parts and lubricating oils. The firm desires catalogues, price lists, etc., covering the above lines. Correspondence should be in Spanish. References are given.

14139. Automobiles.—The Bureau of Foreign and Domestic Commerce is in receipt of a request from a foreign consular officer resident in the United States for the names and addresses of American manufacturers of low-priced automobiles.

14145. Automobile Accessories and Tools.—A firm in Italy has advised an American consular officer that it is anxious to receive offers from American manufacturers and exporters of automobile accessories and tools. The consular officer has forwarded Italian catalogues covering the desired articles. These catalogues may be inspected at the Bureau of Foreign and Domestic Commerce and its branch offices.

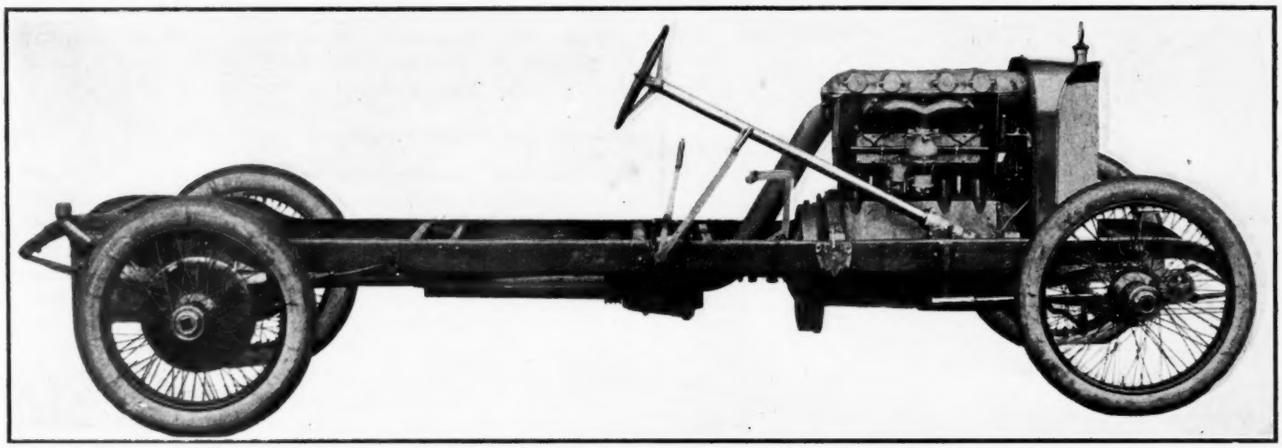
14150. Automobiles.—An American consular officer in South America advises that a merchant in his district, who now has the agency for a European automobile wishes to represent, directly, in his market a cheap American automobile ranging in price from $400 to $600. Correspondence should be in Spanish. Agency conditions and prices f.o.b. New York should be given.

United Electric Reduces Storage Battery Rate

NEW YORK CITY, Nov. 6—The United Electric Light & Power Co., this city, announces a reduction in the minimum monthly charge on the storage battery rate, from $25 to $10 per month beginning with November.

The company is also distributing a list of garages and charging stations in the Metropolitan District to the owners of electric vehicles operating in Greater New York and such other owners as request same.

The list is on a heavy cardboard and is designed to be tacked firmly in the vehicle in order that the operator may determine at a glance the nearest station for boosting his vehicle when such is required.



100-horsepower chassis designed by Finley R. Porter, showing four-cylinder block motor with valves in the head, V-radiator, etc.

F. R. P. 100-Horsepower Chassis, $5,000

Valve-in-the-Head Four-Cylinder Block Motor—Speed and Lightness—Alloy Steel—Bodies to Order

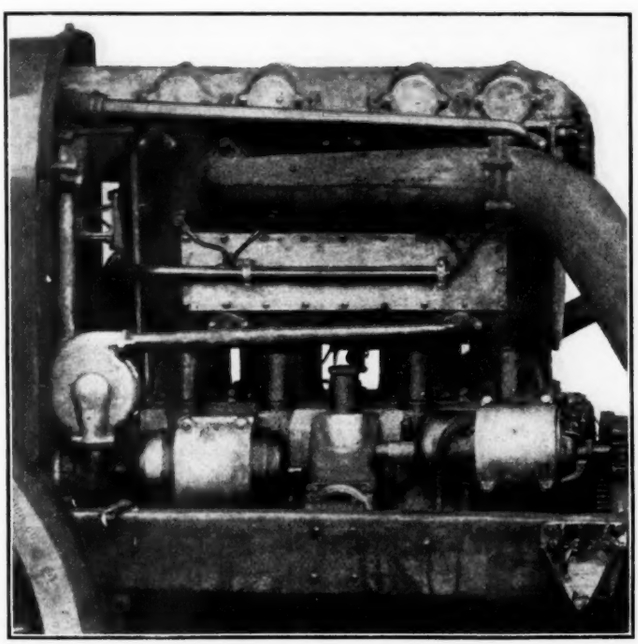
FINLEY R. PORTER, ex-chief engineer of the Mercer company, has brought out a car of his own. As the designer of cars which have captured many road contests in the 300-inch class, it is natural to suppose that the new car would incorporate all the ideas of speed and lightness, that Mr. Porter has gained during his experience as a creator of racing vehicles. The result is a chassis selling for $5,000, incorporating a motor stated to develop more than 100 horsepower and weighing, when fitted with a seven-passenger body, less than 3,500 pounds, according to the designer's figures. The new car is called the F. R. P.

The exceptional qualities of the car have called for some radical work in the use of materials and dimensions. As a unit, the chassis is a study in the use of alloy steel. Practically the entire steel work is of chrome vanadium, so heat treated as to meet the required specifications as to strength and rigidity. In every possible part a magnesium-aluminum alloy of great strength has been used. Tubular connecting-rods, crankshaft and driveshafts, steel pistons, steel-iron cylinders, etc., also play their part in the development of the 580-pound power plant.

Valve-in-the-Head Motor

The motor is a four-cylinder 4.6 by 6.75-inch design, with valve-in-the-head cylinders cast in a block, the A. L. A. M. rating being 33.9 horsepower. The valves are operated by rocker arms from an overhead camshaft. They are of the 45-degree poppet type, shaped so that when they are closed the combustion chamber is practically a hemisphere. By offsetting the rocker arms the valves have been so arranged that the exhausts and intakes are exactly opposite one another in relation to the longitudinal center line of the cylinders.

In taking the drive of the auxiliary shafts, namely, the camshaft, transverse pump and magneto shaft and generator shaft from the crankshaft, worm gears have been used. The camshaft drive is taken, first through a vertical shaft from the crankshaft at the front end of the motor and then, through another worm gear, it is imparted to the camshaft. In every other particular, with the exception of double, 80-pound valve springs, the design does not depart from ordinary valve-in-the-head practice to any radical degree.

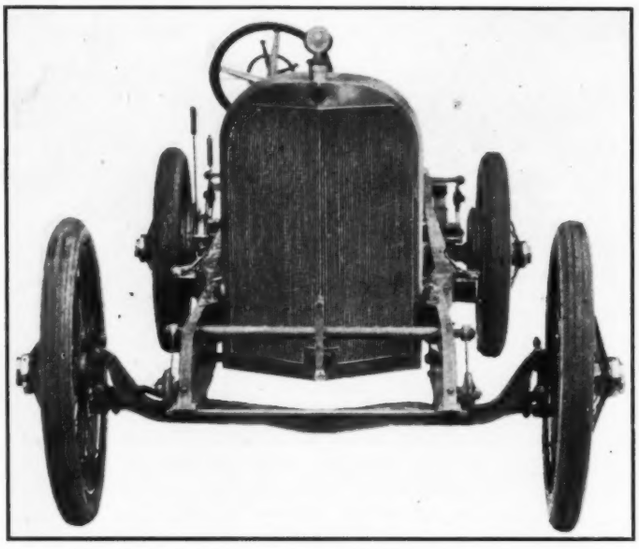


Exhaust side of four-cylinder 4.6 by 6.75-inch block motor used in F.R.P. chassis, showing detachable cylinder head, mounting of Bosch electrical system and circulating pump

14 Miles to the Gallon

From tests so far conducted by the makers, the fuel consumption is estimated to be in the neighborhood of 14 miles to the gallon. The high efficiency of a motor of this size has been gained to a large degree by the high compression which is 112 pounds gauge. The test chassis upon which the experimental work has thus far been carried out has a gear reduction of 3 to 1 on direct. It has shown a speed of 88 miles an hour on the Long Island Motor Parkway.

The tubular connecting-rods are 16 inches long and are of chrome-vanadium steel with .40 carbon. The pistons are nickel steel, .20 carbon



Front view of chassis used in F. R. P. car, showing special V radiator. Note the light, strong design, wire wheels with racing type hubs and Motometer on radiator cap

and are fitted with two rings. They are 5 inches long and have a clearance of .015 inch. They are fitted with two rings above the wristpin. The wristpin bearing is 1.25 inches in diameter and 3 inches long.

The crankshaft is a chrome-vanadium forging with .40 carbon and has a diameter throughout its entire length of 2.5 inches. The center has a hollow core of 1.625 inches diameter. The shaft is carried on three bearings, each having the diameter 2.5 inches, the front bearing being 3 inches in length, the center 3.25 and the rear 5. The bearings are lined with Kelly bronze.

Valve Diameter Is 2.5 Inches

By eliminating the cage construction it has been possible to carry the valve diameter up to 2.5 inches. This plan has been rendered feasible on account of the close proximity of the water jacketing space which is within .25 inch of the valve seat. The valve stems and heads are of tungsten steel and they have a lift of .375 inch. The cams which act directly upon the rocker arms are in a unit with the hollow chrome vanadium camshaft. This shaft has a 1.375-inch exterior diameter and a hollow core 1 inch in diameter. By carburizing the outside of the cams before heat treating the shaft, the exceptional carbon content of 1.0 per cent. has been reached on the surface of the cams, giving a glass-hard bearing face. The rocker arms are not returned to their initial positions solely by the valve springs, but have in addition to these a coil spring of 40-pound-pull, hooked between each pair of exhaust and intake rockers across each cylinder. The half-time ratio is imparted to the camshaft by gearing the vertical worm shaft 1.5 to 1 to the crankshaft and the camshaft 3 to 1 to the vertical wormshaft.

Pressure and Splash Lubrication

Lubrication is accomplished by a combination pressure and splash system. On the bottom of the vertical worm shaft there is a rotary piston pump with four independent leads. One of these leads goes to each of the three main bearings and the fourth is carried to the rear camshaft compartment and connects with a pressure gauge on the dash which registers the pressure on the oil pump. This pump produces about 30 pounds pressure at 1,500 revolutions per minute and has a capacity up to 600 pounds which is sufficient to clear the line in all ordinary cases of clogging. The valve mechanism is so arranged that it is held in a series of cup-shaped compartments at each cylinder. The oil, after filling the rearmost compartment, drains forward and fills in turn each of the others. These compartments are short and deep, providing against spilling the oil on steep grades. By this arrangement the entire valve mechanism operates in a bath of oil.

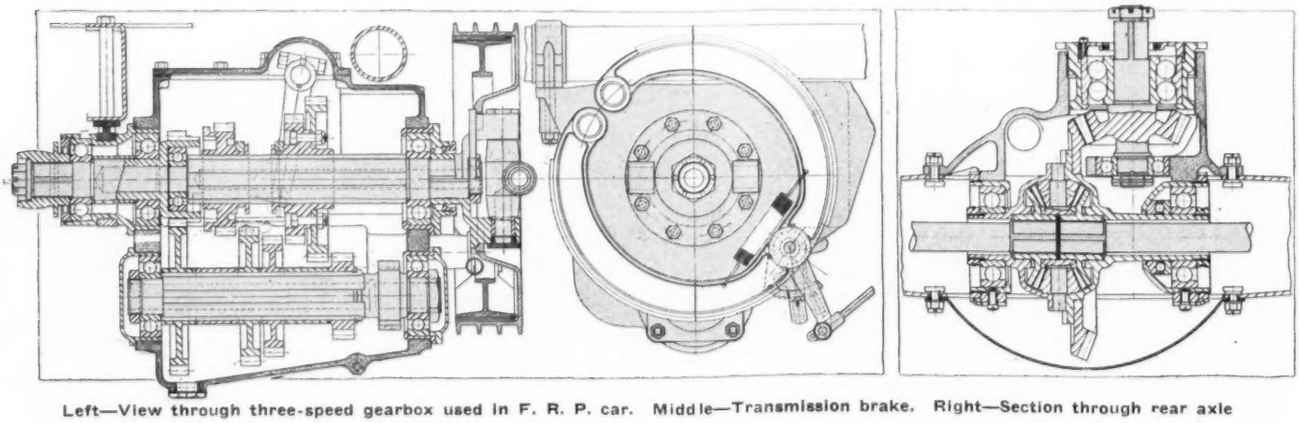
The three other leads carry the oil under pressure to the respective main bearings and after lubricating these the oil passes into a series of troughs which are held in an independent aluminum pan riveted to the interior of the lower half of the crankcase. By means of these troughs a constant level splash arrangement is provided.

Cooling is by water circulated by means of a centrifugal pump. The water-jackets are large and in addition there is an efficient V-shaped radiator which has been made specially by the Mayo company for this car. It has a radiating area of approximately 20 by 26 inches and the honeycomb tubes are 3 inches long. The support of the radiator has been carefully worked out. It is a three-point scheme. The two bottom points are composed of vanadium steel ball trunnions in manganese bronze brackets and the third point is formed by a tie rod across the top.

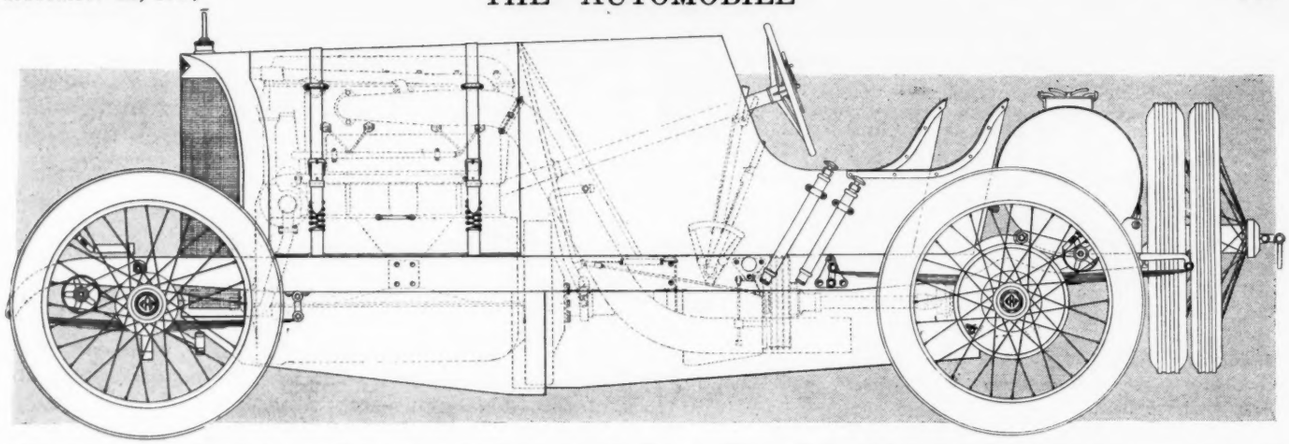
Bosch Electric Plant

A complete Bosch electric plant is supplied with the chassis. This takes care of ignition, lighting and starting. For ignition a two-point scheme, which has as its current source a high-tension magneto, is provided. For starting there is the Bosch 12-volt motor which is geared 7 to 1 to the crankshaft and which is capable of spinning the engine more than 150 revolutions per minute under ordinary circumstances. The generator is also a Bosch 12-volt unit driven at crankshaft speed and capable of carrying the entire lamp load at 12 miles per hour. The entire electric system is worked on the single wire plan and the battery is a Willard 50-ampere hour 12-volt.

The clutch is a cone housed within the flywheel. The fly-



Left—View through three-speed gearbox used in F. R. P. car. Middle—Transmission brake. Right—Section through rear axle



Side view of racing type body mounted on F. R. P. chassis, showing the mounting of the power plant, control features, etc., by means of the dotted lines. Note spare wheels carried at rear

wheel is 21 inches in diameter and is a steel forging providing a clutch surface 19 inches in diameter and 2.5 inches face. Between the clutch and the gearbox there is a compensating joint which can take care of misalignment in any direction. The gearbox provides four forward speeds with direct on fourth. It is carried on annular ball bearings and is provided with a transmission brake which acts as service equipment. This brake shaft, together with the clutch thrust and sliding members, is oiled by the lubricant which passes through the hollow crankshaft by means of a specially drilled lead. The entire gearbox assembly weighs but 80 pounds.

Drive Is Through Rear End of Springs

There are two universal joints in the drive of air-hardened steel. These, together with practically every bolt and nut in the car, are manufactured in the plant of the makers of this car. The drive is delivered to a five-pitch, four pinion differential. The gears are chrome vanadium with twenty-one teeth in the pinion and sixty-one teeth in the crown wheel, giving practically a 3 to 1 reduction. The car is driven through the rear ends of the rear springs. This being done to have the starting moment exerted in settling the chassis downward instead of raising it. All the special bolts and cross shafts in the drive are fitted with graphited bronze bushings which are self lubricating.

The emergency brakes are on the rear wheels and have 16 2.5-inch drums into which they expand. The steering gear is a worm and full gear type also worked out in the designer's plant. It has a magnalium housing with a ball thrust. The column is a 2-inch stationary post with three levers, the third being for carbureter adjustment. The wheelbase is optional and the chassis is sold with full electric equipment.

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Mitchell in Good Shape After 7500 Miles

PITTSBURGH, PA., Nov. 9—The seals on the Mitchell sealed bonnet reliability car, which finished its 30-day run of 7,500 miles, with the seals intact, were broken on November 4 in the showrooms of the Williams-Hasley Motor Car Co., by F. E. Edwards, technical expert of the Contest Board of the American Automobile Assn.

After his examination of the car Mr. Edwards sent in his report to Chairman Kennerdel of the Contest Board, who approved of it and declared the car a stock model.

When the seals were broken the engine was gone over and minutely examined. The valves did not need regrinding, having only a very small deposit of carbon; the bearings were snug; the clutch showed no signs of wear and the transmission and rear axle were in good condition. The brakes were shy of two rivets.

When the seals were broken all evidence of the muddy roads which it had traveled was apparent, the drip pan alone containing over 85 pounds of mud and sand.

The car was equipped with a Stewart vacuum gasoline tank, which is now regular equipment on the Mitchell. An average of 15 1-2 miles to the gallon was made for the trip. No record was kept of oil consumption, which was light.

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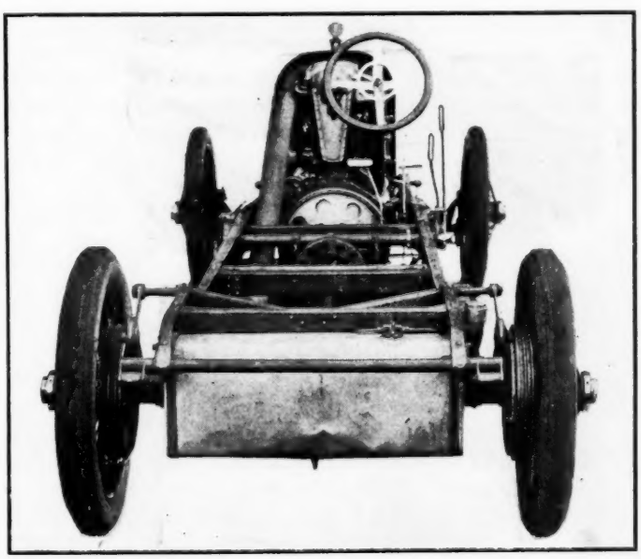
Packard Is Now an All-American Car

DETROIT, MICH., Nov. 5—Vice-president and general manager Alvan Macauley of the Packard Motor Car Co., has announced that all the materials necessary in the construction of Packard cars are now available in America and that the company does not have to apply to any foreign country for any required material. Had the war occurred 10 years ago the company would have had to close down as at that time it was dependent almost exclusively on foreign manufacturers for the following articles needed in the construction of its cars: French cylinder castings, piston and piston ring castings, cone steel for ball bearing races, ball bearings, Fulmen storage batteries, spark coils, magnetos, spark plugs and spark porcelains, high-tension ignition cables, timers, commutators, motor valve forgings, silico manganese gear steel, door locks, door handles, all cloths, laces and silks for trimmings, goat skins for inclosed body upholstery, horns and bulbs.



View of F.R.P. chassis, looking forward, showing large fuel tank in rear, brake drums ridged for cooling, large exhaust manifold, which is a two-part stamping, etc.

The Automobile

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Factory Destruction

AN unfortunate aspect of the present war in France is the destruction of some of the automobile factories in northern France. On other pages of this issue are shown views of one leading French factory that was bombarded and finally burned. Unquestionably this fate awaits other plants in the war zone. To date nothing definite has been given out regarding factories located in several cities that have suffered prolonged sieges.

It is unpleasant to contemplate profiting from the unfortunate experiences of rivals, but this factory destruction points more and more certainly to the situation that will rule when hostilities cease. It is weekly becoming more apparent that many of the continental factories will be in a condition of utter disorganization when the war ends, and that it will take a year, perhaps longer, for them to get on a production basis. Automobiles will be needed and the American market will be looked to in supplying this demand.

At present the war departments are asking for small touring cars. The demand is for a small four-cylinder car. Europe has never been a strong advocate of the six, preferring the small high-efficiency four. The American concerns that hope to profit by the fate of war and its destruction should aim to be ready to supply nearest to what is demanded. The good merchant always has on the counter those goods that are in most demand. This is a good leaf from the book on exporting to keep in mind when developing a new export business after the close of the war.

A Truck Show?

THE National Automobile Chamber of Commerce, Inc., at its regular monthly meeting last week acknowledged in a more or less direct way that there is at least some necessity for a motor truck exhibition, a position in strong contrast with the stand taken by this organization nearly 2 years ago, when it voted to discontinue truck shows.

It is not proposed to have truck exhibits at the New York or Chicago show, but rather that space be set apart for the use of the thirty-three makers of trucks who are members of the association.

This shows a tendency in the right direction, a movement which will serve to bring motor trucks to the attention of the industry during the show circuit. The motor truck is more in the public eye today than it has been since its inception. It is revolutionizing the present war, and, in fact, although in general use at present, gives promise of being utilized in every department of the war.

It is regrettable that more members of the American motor truck industry are not represented in the membership of this national governing body. There are many truck makers who are not members of any organization, but who should be, and who are consequently suffering that loss, which always comes from not being members of such industrial organizations that are for the benefit of the industry.

Organization is one of the best indications of progress. The organization can accomplish what is impossible with the individual. Every movement that aims to broaden the scope of organization is welcomed.

THE AMERICAN MOTOR TRUCK INDUSTRY IS LARGE ENOUGH TO WARRANT SOME COLLECTIVE DEMONSTRATION ONCE A YEAR BEFORE THE NATION. THIS DEMONSTRATION MIGHT BE IN THE FORM OF SOME GREAT CONVENTION; IT MIGHT TAKE OF THE NATURE OF A NATIONAL DEMONSTRATION; OR IT MIGHT ASSUME THE PROPORTIONS OF SOME SUITABLE FORM OF SHOW, OR COMBINED SHOW AND DEMONSTRATION. LET IT BE SOMETHING.

Unfortunately at the present time the American motor truck industry is not a unit as it should be. There are some of the older concerns that apparently do not welcome all the newer companies into the older organizations. At present some of these new concerns are not perhaps following as orthodox methods of merchandising as a few of the older companies. This is one of the prime reasons why closer organization is desirable. The truck industry deserves collection protection, and it is natural to expect that the older members of the industry will bear their share of this burden.

1,600 Good-Roads Delegates in Atlanta

Fourth Annual Convention of American Highway Assn. Sets New Record—Good Roads Making Fast Progress—18,000 Miles of Hard Roads Built in 12 Months

By J. C. Burton
(Staff Correspondent)

ATLANTA, GA., Nov. 9—Fifty years ago the forces of North and South met in Atlanta to decide a question over which there was a decided difference of opinion. Today, the forces of North and South again met in Atlanta to discuss a question of almost equal economic and social importance but one in which each side shares the other's sentiments. Fifty years ago, the forces of North and South assembled under different flags. Today they rallied around a common standard, the gonfalon of highway improvement.

Atlanta Under Siege

Since early yesterday, the historic city has been in a state of siege. In the past 36 hours, more than 1,600 delegates, recruited from all sections of the country, have swept down upon Sherman's base of supplies in 1864 to attend the fourth annual American Road Congress, which opened this morning and will continue throughout the week and which is being held under the auspices of the American Highway Association, the American Automobile Association and the Association of County Commissioners of Georgia.

Never before in the history of national conventions for the purpose of advocating the building of good roads has there been as much enthusiasm shown as is being displayed here. Never before has the American Road Congress attracted so great a crowd of delegates as has the conclave of this week. The cities along the Atlantic seaboard alone sent sixteen Pullmans full of delegates. Even far off California and Washington are represented. Moreover, it is a most representative gathering. All except five or six states of the forty-eight in the sisterhood have sent their highway engineer or commissioner to attend the sessions.

18,000 Miles in 12 Months

In his opening address, Logan Waller Page, director of the United States office of public roads and president of the American Highway Association, reviewed the good road work of the past year to prove that the campaign is nation-wide in importance and one in which every state, county and township now is vitally interested. During the past 12 months 18,000 miles of hard-surfaced roads had been built in this country at a cost of more than $200,000,000.

Speaking of the use of convicts for road work, President Page said:

"An exceedingly important factor that has come into prominence in solving our road problems during the past 10 years is that of convict labor. Many of the states are using their convicts in the building of roads and the preparation of road materials and I congratulate Georgia on her lead of all the states in this respect. Georgia, I understand, now has a great road-making army of more than 5,000 convicts which is rapidly transforming the road system of the state. We have estimated that the total convict labor days on road work throughout the United States will exceed 3,000,000. As indicating the trend of this movement, I might say that during the year the states of Ohio, New York, Wisconsin and West Virginian have authorized the use of convicts in this way, thus indicating that this policy has no geographical bounds to its field of usefulness."

Other speakers were Governor John M. Slaton, of Georgia, Mayor James A. Woodward, of Atlanta, President Austin B. Fletcher, of the American Road Congress, Robert P. Hooper, former president of the American Automobile Association and Lewis B. Speare, president of the Massachusetts A. A.

Cotton Belt Route Proposed

ATLANTA, GA., Nov. 10—*Special Telegram*—Coincident with the Fourth American Road Congress which is being held at Atlanta this week, plans for a new motoring highway to connect Chicago and Jacksonville and to be known as the Cotton Belt route, were born here today. William S. Gilbreath, of Indianapolis, Secretary of the Hoosier Motor Club is sponsor for the project which originated with Carl Fisher, builder of the Indianapolis Motor Speedway and father of the Lincoln Highway.

According to present plans the proposed North-and-South link in the country's chain of motor roads will pass through Indianapolis, Louisville, Nashville, Chattanooga, Atlanta, and Macon giving the motorists an opportunity to visit en route such places of historic and scenic appeal as the Lincoln Farm, the Mammoth Cave, the Blue Ridge mountains of Kentucky and Tennessee and the Civil War battlefields in the vicinity of Chattanooga and Atlanta.

U. S. Army To Test Motor Tractor

WASHINGTON, D. C., Nov. 7—The conclusion has been reached by the war department, at the instance of the army board of ordnance and fortifications, that it would be advisable to have a comparative test of types of motor tractors, with a view of ascertaining or developing a vehicle of such design and manufacture as will make it useful to the army in the transportation of ammunition, supplies and equipment.

More than a year ago the board made an allotment for the purpose of acquiring a French motor tractor, which one of the American military observers found was used extensively and effectively in the French military service. Efforts were made to obtain this vehicle but after much correspondence and several increases in the allotment it was ascertained that the French makers of the vehicle were not willing to sell outright the tractor and the proposal to loan the vehicle for the purposes of experiment came to nothing, the war in Europe intervening to terminate the negotiations.

The suspicion has been entertained that the foreigners were, for some reason, not particularly desirous of sending over any of their vehicles. This circumstance has served to postpone the test which was contemplated and which, it was proposed by the board of ordnance and fortifications, should be conducted by representatives of various branches of the service.

Now it is recommended that the test be conducted of vehicles of American design and manufacture. It was contemplated that the test should be under the auspices of the board of ordnance and fortifications, but the secretary of war has decided that it shall come under the general staff. That body is now gathering information for the purpose of having extensive experiments. In the meantime contracts continue to be awarded by the quartermaster general for trucks.

Recently bids were opened for furnishing two four-wheel-drive motor trucks for the army. The specifications were drawn as a result of tests by the quartermaster corps of various trucks designed for army purposes. The following bids were received: Duplex Motor Co., Charlotte, Mich., $2,200 each; Thomas B. Jeffery Co., Kenosha, Wis., $2,500 each; Driggs-Seabury Ordnance Co., Sharon, Pa., $2,640 each: Four Wheel Drive Auto Co., Clintonville, Wis., $2,380. Contracts will be awarded in the near future.

Stevens-Duryea Sales Total $3,503,500.94

End of Fiscal Year Shows 14,000 Cars Built Since Inception of Company

ATWATER KENT AND HUPMOBILE BUSINESS GROWS

CHICOPEE FALLS, MASS., Nov. 9—The Stevens-Duryea Co. has issued its statement for the fiscal year ending October 31, 1914. In a letter accompanying the statement the company calls attention to its liberal reserves for depreciation, and to the fact that nothing is carried to the credit of the company to cover patents, drawings, patterns or good will. The total sales for the past business year have been $3,503,500.94. Since beginning business the company has sold 14,000 automobiles. The statement is as follows:

CURRENT ASSETS:		
Cash on hand		$84,712.76
Accounts receivable		64,850.40
Notes receivable		7,235.00
Total		$156,798.16
Inventory		$1,230,769.45
FIXED ASSETS:		
Real estate, buildings and equipment		$856,185.53
Tools and machinery		861,576.10
Office furniture		17,414.60
Miscellaneous assets		63,400.00
Total		$1,798,576,23
Total assets		$3,186,143.84
LIABILITIES:		
Current Liabilities:		
Bills payable		$184,000.00
Accounts payable		25,533.77
Accrued taxes		7,993.00
Total		$217,526.77
Capital account:		
Capital stock		$300,000.00
Reserves:		
Reserves for depreciation		594,803.85
Surplus		$2,668,617.07
Total liabilities		$3,186,143.84

Atwater Kent Business Increases 800 Per Cent.

PHILADELPHIA, PA., Nov. 9—A. Atwater Kent, manager of the Atwater Kent Mfg. Works, this city, has just returned from an extended trip through the Middle West, in which the majority of the factories in the industry have been visited. He reports that indications are for a busy season next year in spite of the effects of the war. Present indications would show that more radical and rapid developments are taking place in the automobile industry at present than during the past 6 or 7 years. His company's business has increased 800 per cent. in the last year, and 1915 business will be approximately double that of the present season.

Another Dividend for Creditors of R-C-H

DETROIT, MICH., Nov. 6—At the meeting of creditors of the R-C-H Corp. held yesterday in the offices of referee in bankruptcy Lee E. Joselyn, the latter entered an order directing the Security Trust Co., trustee, to pay a dividend of 25 per cent. to all creditors whose claims accrued after October 25, 1912, the day when the extension agreement was signed. About $80,000 will now be disbursed by the trust company and it is stated that another dividend of 25 to 30 per cent. will be declared within the next 90 days. Last year a first dividend of 5 per cent. was paid.

1,382 Hupmobiles Shipped in October

DETROIT, MICH., Nov. 6—October was the biggest month of business the Hupp Motor Car Co., has ever had in the United States, according to President J. Walter Drake. The total number of cars sold and shipped was 1,382, which, considering the war and other conditions is a most remarkable and encouraging showing. During September and October the Hupmobile business has more than doubled as compared with the same months in any previous year in the history of the company. Most of the cars shipped went to the Middle West, Northwest and Pacific Coast and despite the unfavorable business conditions in the cotton belt a fair amount of business was transacted in that part of the country and reports have been received showing that conditions there are now improving.

Johns-Manville Takes Over Tirenew and Narco

NEW YORK CITY, Nov. 7—The H. W. Johns-Manville Co. has concluded arrangements with the National Rubber Co. whereby it becomes the sole distributor of Tirenew and Narco products.

These goods will hereafter be advertised as J-M Tirenew and J-M Narco products and will be subject to the same guarantee or quality that obtains on all automobile accessories, etc. sold under the J-M emblem.

J-M Narco products are mediums for making tire repairs, re-finishing automobile tops and so forth.

Marked Activity in Rubber Imports

NEW YORK CITY, Nov. 5—During the 7 days from October 16 to 22, inclusive, there reached this port 2,705,900 pounds of crude rubber, a quantity fully equal to the average of last year's imports. Steadier buying also is reported from London, and an upward movement is generally looked for.

DETROIT, MICH., Nov. 6—Within the next few days the Security Trust Co. will mail a second dividend of 12 1-2 per cent. to the creditors of the Disco Co., which made electric starting and lighting systems. This will make a total of 22 1-2 per cent. dividends paid thus far and the trust company believe that a third dividend of approximately the same amount will be paid to the creditors when the estate is finaly closed.

AKRON, O., Nov. 5—The Goodyear Tire & Rubber Co. has declared a 12 per cent. annual dividend on the common stock. This is the same as a year ago.

Final Stages in Controversy Over Horn Patents

NEW YORK CITY, Nov. 10—The latest court action in the controversy which has been carried on in the New York courts between the Lovell-McConnell Mfg. Co., maker of Klaxon horns, and the Automobile Supply Mfg. Co., Inc., maker of Newtone horns, is that Klaxon has been denied a rehearing of the case in the Circuit Court of Appeals, and has been directed to pay the costs of the suits against fourteen dealers selling Newtone horns, together with the costs of the litigation in the Circuit Court of Appeals and also the District Court in Brooklyn, where the earlier arguments were heard.

The bill of complaint of Klaxon against Newtone has been dismissed and also the bills against the fourteen dealers selling Newtone horns. The only remaining course for Lovell-McConnell is to petition for a hearing before the Supreme Court of the United States.

On October 6 the Circuit Court of Appeals denied the motion of Klaxon for a re-hearing, and confirmed the decision of Judge Coxe handed down in that Court on June 8, which held "that the broad claims in controversy of the Hutchison patents are invalid and that the claims which cover specific details, if valid, are not infringed."

On October 15 the Circuit Court of Appeals issued a mandate to the District Court for the Eastern District of New York instructing it that the decision of the District Court in favor of Klaxon handed down by Judge Chatfield January 10, 1914, was reversed with costs of $3,346.13, to be paid by Klaxon. The mandate ordered the Brooklyn Court to dismiss the bill.

On October 20 Judge Veeder issued an order in the Brooklyn Court dismissing the Klaxon bill of complaint and cancelling the bonds given by the Automobile Supply Mfg. Co., Inc., as security for costs. On October 26 an order signed by Judge Veeder fixed the costs of the Brooklyn suit at $1,436.62, and ordered that, inasmuch as this sum as well as the sum of $3,346.13 representing the costs of the action in the Circuit Court of Appeals, has been paid in full by Lovell-McConnell, the bill of complaint be dismissed. Following

this, on October 31 Judge Chatfield signed an order in the Brooklyn District Court on motion of the Klaxon counsel extending the term of the court for all purposes of this suit for a period of 6 months from the date of the final decree.

Reorganize Hans Motor Equipment Co.

LACROSSE, WIS., Nov. 7—The Hans Motor Equipment Co., Lacrosse, Wis., one of the largest producers of pressure and capacity gauges, oil pumps and other motor car parts and accessories in the Middle West, is undergoing a financial reorganization under the direction of Dan W. MacMillan of Lacrosse, in favor of whom the concern has executed a trust deed. The company has a current indebtedness of about $18,000, which will be liquidated at once. It moved to Lacrosse and built a new factory with the assistance of the Lacrosse Industrial Assn. about two years ago and the reorganization is meant to place the concern on a sound footing for the future. It is stated that the company is in good condition, having materials on hand valued at $30,000 fully paid for and machinery, tools and equipment appraised at $50,000.

Greatest Year for Long Mfg. Co.

DETROIT, MICH., Nov. 9—The Long Mfg. Co., maker of radiators, has just ended its fiscal year with a 200 per cent. increase in sales over any previous year. The sales of the months of September and October reached the highest mark in the history of this company. The September production was 300 radiators per day and the specifications for spring delivery have exceeded those of any past season.

Voiturette Sold to Winternitz for $100,000

DETROIT, MICH, Nov. 10—The American Voiturette Co., Detroit, Mich., has passed into the hands of the Samuel L. Winternitz Co., Chicago, Ill. The Federal Court in Detroit today confirmed the latter company's offer of $100,000 for the real estate, accounts, notes and cash. It is stated by the Detroit representative of the Winternitz company that the building of Car-Nation cars will be continued. The receiver, the Detroit Trust Co., has requested that creditors offer proof of claims within the next 90 days.

Motor World Buys Motor Field and Merges It

NEW YORK CITY, Nov. 10—*Motor Field*, the monthly publication that has enjoyed such a large middle and far Western circulation since the inception of the automobile industry, has been purchased by the A. B. Swetland Co., New York, and will straightway be merged with *Motor World*.

It was realized that *Motor Field*, being a monthly publication, failed to adequately serve its important dealer clientele as a newspaper. Live dealers must have news of the industry quickly. All of *Motor Field's* dealer circulation will be absorbed by *Motor World*. This big addition of Western circulation to the present *Motor World* strength throughout the territory east of the Mississippi river will present a wonderful merchandising force capable of promoting material advantage both to the automobile accessory dealer and manufacturer.

Until 1 year ago *Motor Field* was published in Denver by the G. A. Wahlgreen Co., and when sold to the Van Sicklen Publishing Co. was removed to Chicago, since which time its circulation has been intensified and its scope of usefulness largely increased.

By the merger with *Motor World* there comes into existence a dominant publication that covers the dealers from ocean to ocean. The A. B. Swetland Co., publishers of *Motor World*. is a unit of the Class Journal Co., owners of THE AUTOMOBILE, *Motor Age* and *Motor Print*.

The advertising department of the Class Journal Co. will continue to represent *Motor World*, assisted by Messrs. Fred W. Van Sicklen and N. H. Van Sicklen, Jr., with Charles B. Shanks as business manager.

Allen Motor Co. Is Member of C. of C.

NEW YORK CITY, Nov. 9—At the last meeting of the Directors of the National Automobile Chamber of Commerce, the Allen Motor Co., Fostoria, O., became a member.

Handley Buys Marion —To Re-Organize Co.

Assets Bring $120,000—Announcement of Plans Soon—Sheldon Has New Axle

THREE NEW APPERSONS—CO. TO SELL NORWALK

INDIANAPOLIS, IND., Nov. 5—The assets of the Marion Motor Car Co., were sold today to James I. Handley, president of the company, for $120,000. Mr. Handley, who has been connected with the Marion company for the past few years, has arranged to surround himself with a good organization and will make a definite announcement regarding the company's policy in the near future.

The affairs of the existing Marion company have been more or less in the courts since October, 1913, when a receiver was appointed for the company. In December of that year the receiver was discharged after the creditors had agreed to an extension of their paper. In July, 1914, J. M. Edsall, the company's superintendent, offered $150,000 for the assets, which offer was refused by the Indianapolis attorney representing a number of the creditors. The sale was also objected to by the board of directors of the Marion company. Soon after this the Marion company distributed $130,000 by way of dividends. The company's matters were kept clear of the courts until recently. The policy pursued has apparently been highly approved by the creditors who are now realizing about $125,000 more than they were offered in July.

Now the Sheldon Axle and Spring Co.

WILKES-BARRE, PA., Nov. 9—In order to link together in its incorporate name both articles that go to make up the bulk of the Sheldon output, the name of the Sheldon Axle Co. has been changed to the Sheldon Axle and Spring Co.

The company has recently completed a number of large additions. The entire axle assembly department has been moved into new quarters and complete equipment of new machinery has been installed in the vacated assembly room, which is devoted exclusively to the worm gear proposition.

In this connection announcement also is made by the company of the bringing out of a new 1,500-pound worm gear driven axle which is now ready for delivery in quantities. This now gives a standard line of Sheldon worm gear drive rear axles consisting of four sizes, namely, 1,500 pound, 1, 2 and 3 ton.

The new size is identical in design with the previous sizes, using ball bearings throughout for both the radial and thrust loads in the worm itself.

Three 1915 Appersons at $1,350 to $1,585

KOKOMO, IND., Nov. 9—The Apperson Bros. Automobile Co., Kokomo, Ind., has three new models for 1915. These are model 4-40, a five-passenger car with 116-inch wheelbase and a 3½ by 5 motor listing at $1,350; model 6-45, a five-passenger car with 122-inch wheelbase and a 3½ by 5 motor listing at $1,485; and model 6-48, a seven-passenger car with 126-inch wheelbase and a 3½ by 5⅛ motor listing at $1,585.

Company Organized To Sell Norwalk Six

MARTINSBURG, W. VA., Nov. 7—A charter has been granted to C. W. Kilbourn, Max Robinson, S. P. Hopkins, of Martinsburg, G. B. Goetz, Charlestown, W. Va., and R. W. Alexander, Baltimore, Md., as incorporators of the Norwalk Distributing Corp.

The new corporation will have the sole distribution of the Norwalk underslung automobiles, and will handle both the domestic and foreign business.

It will market a light six. The general offices will be located in this city, with branch offices in New York City, covering the export department.

In October Charles G. Smith was appointed receiver of the Norwalk Motor Car Co., on petition of an officer of the company. The court granted permission to the receiver to borrow money for operating expenses and to continue the operation of the plant for 2 months, by which time it was believed the company would be reorganized.

September Exports Total 774 Cars

War Cuts Shipments 985 as Compared with 1913—Trucks Gain—Complete Statistics

WASHINGTON, D. C., Nov. 9—In addition to the figures published last week in THE AUTOMOBILE showing the exports of motor cars during September and the 9 months ending September, the following detailed figures, are herewith presented for the benefit of the industry. They are the latest figures compiled by the federal bureau of statistics and give a general idea of what conditions were up to October 1 last.

The total exports of commercial and passenger vehicles for September, 1914, dropped approximately 56 per cent. under those for the same month in 1913. For the 9 months ending September, 1914, the exports dropped only 3 per cent. below those of the same period in 1913. The exportation of parts, not including engines and tires, gained $2,371.

Eighty more trucks were exported in September, 1914, than in the same month of 1913 while the automobile exportation dropped in number 1,065. Both the loss of the passenger vehicles and the gain of the commercial vehicles amounted each to 62 per cent.

Canada was our largest buyer during September with British Oceania next. Canada purchased 260 while British Oceania purchased 219. The United Kingdom bought 136 vehicles. For the 9 months ending September, United Kingdom led with a total purchase of 5,130 vehicles valued at $4,281,026. Canada was next with 3,854 at $4,881,062.

The total value of tires exported from this country in September, 1914, amounted to $266,259 or $55,556 lower than for the same month in 1913. England was the largest buyer, the purchases amounting to $134,801.

Imports of automobiles during September, 1914, amounted to $95,170 as against $79,079 for September, 1913. The bulk of these cars came from Italy, which sent over forty machines. The same country sent only sixty-six for the 9 months ending September.

France sent over seven cars during September, 1914, valued at $24,650. The United Kingdom during the same month sent over nine cars valued at $19,537, just three better than September, 1913. The French imports were six less than the same period in 1913.

	September				Nine months ending September:			
	1913		1914		1913		1914	
	Number	Value	Number	Value	Number	Value	Number	Value
EXPORTS								
Automobiles:								
Commercial	48	$91,054	128	$294,288	778	$1,351,140	637	$1,066,545
Passenger	1,711	1,466,322	646	597,904	20,175	19,950,718	19,530	17,209,964
Total	1,759	$1,557,376	774	$892,192	20,953	$20,301,858	20,167	$18,276,500
Parts of (not including engines and tires)	.....	$463,134	.....	$343,618	.....	$4,448,792	.....	$4,451,163
				BY COUNTRIES				
France	48	41,745	.....	.....	655	510,331	1,044	625,636
Germany	27	13,504	.....	.....	858	747,543	1,063	799,552
Italy	7	4,555	2	1,860	259	222,008	231	150,248
United Kingdom	469	310,099	136	154,763	3,900	2,934,237	5,130	4,281,026
Other Europe	94	67,413	12	9,570	1,483	1,263,828	2,390	1,896,217
Canada	253	345,095	260	433,620	5,260	7,050,317	3,854	4,881,062
Mexico	15	33,169	8	8,810	175	321,379	68	79,184
West Indies and Bermuda	48	40,265	42	37,240	370	361,428	394	342,550
South America	126	123,817	24	19,735	2,089	2,372,980	915	742,262
British Oceania	261	219,147	219	155,597	2,418	2,275,226	2,885	2,449,630
Asia and other Oceania	139	145,248	39	38,975	1,770	1,748,083	1,232	1,168,380
Other countries	272	213,319	32	32,022	1,716	1,494,498	961	860,762
Tires for automobiles:								
Belgium	.....	.....	.....	.....	.....	98,769	.....	301
Germany	.....	235	.....	.....	.....	422,535	.....	81,917
England	.....	153,182	.....	134,801	.....	1,130,284	.....	1,071,061
Canada	.....	88,905	.....	53,419	.....	977,679	.....	795,972
Mexico	.....	15,180	.....	8,341	.....	113,698	.....	50,165
Philippine Islands	.....	13,147	.....	14,886	.....	101,839	.....	92,575
Other countries	.....	51,166	.....	54,812	.....	399,211	.....	464,362
Total	.....	$321,815	.....	$266,259	.....	$3,244,015	.....	$2,556,353
IMPORTS								
Automobiles.....no dut.	37	79,079	62	95,170	388	$908,799	186	$293,610
Parts of (except tires).dut.	.....	21,105	.....	64,573	.....	191,436	.....	698,624
Total automobiles and parts of	.....	$100,184	.....	$159,743	.....	$1,100,235	.....	$992,234
Automobiles:				BY COUNTRIES				
France	13	$32,401	7	$24,650	143	$331,311	58	$116,367
Germany	2	8,444	.....	.....	77	202,931	10	16,556
Italy	14	15,591	40	42,496	68	125,918	66	74,380
United Kingdom	6	19,809	9	19,537	37	112,362	24	51,033
Other countries	2	2,834	6	8,487	63	136,337	28	35,274

Market Reports for the Week

This week's market reports showed no important changes. These were few and small. A few of the markets have shown a lowering demand during the past week, especially the metals. Though tin went up $0.13 per 100 pounds, this metal showed less demand for future positions. Both coppers were held more firmly this week, but the demand was small. Lead remained quiet but steadier in the open market. Antimony, though strong at the beginning of the week dropped on Friday to $0.13 1-2. This product is less active and less strong at the closing. There were no changes in the oils and lubricants markets. An easier tone developed in the rubber markets on Tuesday. This was due to the announcement of the destruction of the German cruiser Emden. The prices were generally 1 to 1 1-2 cents lower for all grades. Up-River Para dropped to $0.65. Trading was quiet in this market. Stocks of rubber at Para and Manaos in first and second hands on November 1 were 1,500 tons smaller, it was stated, that on the same date last year.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Changes
Antimony	.14	.14	.13½	.13½	.13½	.13½	.....
Beams & Channels, 100 lbs.	1.21	1.21	1.21	1.21	1.21	1.21	.....
Besesmer Steel, ton	18.50	18.50	18.50	18.50	18.50	18.50	.....
Copper, Elec., lb.	.11⅛	.11⅜	.11⅜	.11⅛	.11⅛	.11⅛	+.001/10
Copper, Lake, lb.	.11⅜	.11¼	.11¼	.11⅜	.11⅜	.11⅜	+.001/10
Cotonseed Oil, bbl.	5.10	5.27	5.65	5.50	5.30	5.33	+.23
Cyanide Potash, lb.	.25	.25	.25	.25	.25	.25	.....
Fish Oil, Menhaden, Brown	.40	.40	.40	.40	.40	.40	.....
Gasoline, Auto, bbl.	.13	.13	.13	.13	.13	.13	.....
Lard Oil, prime	.90	.90	.90	.90	.90	.90	.....
Lead, 100 lbs.	3.50	3.50	3.50	3.50	3.50	3.50	.....
Linseed Oil	.45	.45	.45	.45	.45	.45	.....
Open-Hearth Steel, ton	18.50	18.50	18.50	18.50	18.50	18.50	.....
Petroleum, bbl., Kans., crude	.55	.55	.55	.55	.55	.55	.....
Petroleum, bbl., Pa., crude	1.45	1.45	1.45	1.45	1.45	1.45	.....
Rapeseed Oil, refined	.73	.73	.73	.73	.73	.73	.....
Rubber, Fine Up-River, Para	.66	.66	.66	.66	.66	.65	—.01
Silk, raw, Ital.	..	4.25	..	..	4.20	4.10	—.15
Silk, raw, Japan	..	3.23	..	..	3.20	3.20	—.13
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb.	33.25	34.00	34.13	34.00	34.20	34.38	+.13
Tire Scrap	.05	.05	.05	.05	.05	.05	.....

Boston's Electric Salon a Success

Exhibitors Well Pleased with Results—Some Sales —Dates for Other Shows

BOSTON, MASS., Nov. 9—Boston's second Electric Automobile Salon ended tonight and all exhibitors reported that they were very well pleased with the results. Throughout the week there was a good attendance, and various features were arranged to attract people who would appreciate electrics. With the $1 admission there was not a throng at any time, and so the visitors had a chance to inspect the machines very thoroughly. Under the rules there was no open solicitation of orders. And when a visitor finished looking over one make the salesman introduced her to the man in charge of the next exhibit. But some sales were closed during the week. President Louis S. Gibbs of the Electric Motor Car Club said that all the exhibitors expressed themselves as well satisfied and that they would be glad to exhibit again if the club has another Salon. So it is now assured that the exhibition will become an annual affair. The club is working hard to remove the restrictions in the down town section relative to traffic and parking of motor cars, and if it is successful the sales of electrics will be very much larger in Boston.

59 Exhibitors at Providence Show

PROVIDENCE, R. I., Nov. 9—The sixth annual automobile show to be held in Providence will open on November 14 and continue until the following Saturday.

The show, which will be held in the armory, will have this year thirty-five passenger car, twelve commercial vehicle and twelve motorcycle and accessory exhibitors. Forty-four separate makes of passenger cars will be shown, while the number of commercial vehicles will be fifteen.

The Providence Dealers Assn. is promoting it, and P. S. Clark, who was in charge of last year's show, will again be general manager.

Milwaukee Show Dates Are Jan. 8-14

MILWAUKEE, WIS., Nov. 7—The seventh annual Milwaukee show, and the fifth to be held under auspices of the Milwaukee Automobile Dealers' Assn., will be held in the Auditorium at Milwaukee, beginning Friday evening, January 8 and closing Thursday evening, January 14. The Milwaukee show opens on the heels of the metropolitan show in New York and practically co-incident with the Philadelphia show, neither of which are near enough to interfere with the local exposition in matter of attendance or securing of exhibits.

No Building Large Enough for Detroit Show

DETROIT, MICH., Nov. 9—The annual automobile show promoted by the Detroit Automobile Dealers' Assn. will be held the week of January 16. No building has as yet been decided upon.

Philadelphia Show Jan. 9-16

PHILADELPHIA, PA., Nov. 7—At a meeting of the Philadelphia Automobile Trade Assn. in the headquarters, it was decided that the 1915 exhibition will be held in the Metropolitan building, Broad and Wallace streets, the same as last year. The dates are January 9 to 16 inclusive.

William P. Herbert, president of the association, will be chairman of the Show committee, and his associates are R. M. Cook, E. C. Johnson, J. E. Gomery, E. B. Jackson and H. Warren Terry, the last-named being secretary of the committee.

Railroad Classification Committee Visits Plants

DETROIT, MICH., Nov. 10—Having expressed the desire for a preliminary conference with the automobile industry through the National Automobile Chamber of Commerce in the matter of automobile loading and weights, the entire Uniform Classification Committee of the railroads visited Detroit last week with the Traffic Committee and Traffic Manager of the N. A. C. C., and devoted 2 days to visiting the factories.

This is of particular importance as the Uniform Classification Committee will rewrite the classification of automobiles and parts as to package requirements, minimum carload weights, articles on which carload ratings will be granted, etc., and their recommendation is likely to be adopted by railroads in Western, Southern and Official classification territories, to take the place of the separate classifications now prevailing.

The dunnage allowance of 500 pounds per carload has been discontinued on all freight, including automobiles, and the railroads now propose to charge $1 per vehicle on automobile carloads, or less than carloads, when labor, materials for blocking and bracing in cars is furnished by carriers.

Nuckols Director in Valvoline Oil Co.

NEW YORK CITY, Nov. 9—Henry W. Nuckols, formerly president of the Columbia Motor Car Co., and now connected with the Packard Motor Car Co., Detroit, has purchased an interest in the Valvoline Oil Co., and will become a director and administrative officer in that company with headquarters at 11 Broadway. He will take up his duties immediately. This company has its refineries at Butler and Warren, Pa., and Edgewater, N. J.

NEW YORK CITY, Nov. 9—L. H. Kittredge, president of the Peerless Motor Car Co., Cleveland, O., sailed last week for Europe, where he is studying the motor truck situation. Sailing on the *Lusitania* with Mr. Kittredge was I. M. Lewis, general manager and treasurer of the Bessemer Motor Truck Co., Grove City, Pa.

Industrial Group to Improve Conditions

NEW YORK CITY, Nov. 6—Last spring the Exhibit of Better Industrial Relations was given under the auspices of the Business Men's Group, which is being reorganized and will hereafter be known as the Industrial Group of the Society for Ethical Culture.

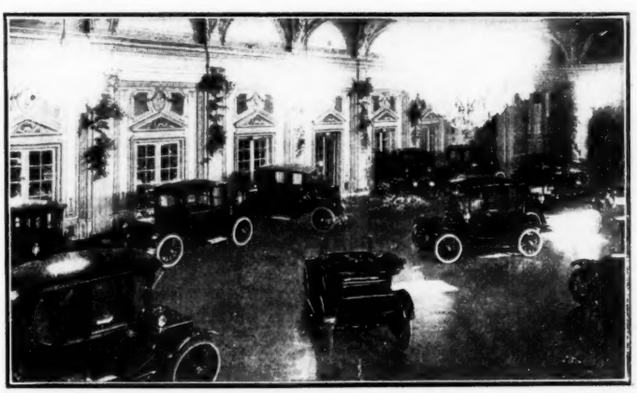
Grant Six with Electric System for $795

DETROIT, MICH., Nov. 11—*Special Telegram*—The Grant Motor Co., Findlay, O., has announced a six-cylinder model to sell at $795. It has 106-inch wheelbase, standard tread and is equipped with a 2 7-8 by 4 1-4-inch block motor.

Other specifications are three-speed gearset, floating rear axle, left drive, center control, cone clutch, cantilever rear spring suspension, unit electric motor generator for lighting and cranking and cowl gasoline tank.

The car carries complete equipment, but if desired, can be had for $45 less without electric cranking and lighting. When so fitted, acetylene lights are furnished. The body is a five-passenger type of sloping lines.

The addition of this car to its output will not interfere with the making of the small four-cylinder roadster at $425, which has up to this time, been the single product of the Grant company since it started in business 2 years ago. It is probable that additions to the plant will be made during the coming year to take care of increased reduction, due to the bringing out of the six, according to the Grant concern.



View of Boston's second electric Automobile Salon

Oldfield Leads in Desert Race

Arrives at Prescott on Second Leg of 671-Mile Contest—Covers 236 Miles in 9:20

PRESCOTT, ARIZ., Nov. 10—*Special Telegram*—Barney Oldfield in the Los Angeles-Phoenix race arrived first at the night control at Prescott at 2:52. His time from Needles, Cal., was 9 hours and 20 minutes, the distance being 236 miles. Olin Davis, who was fourth at the Needles control, arrived second at Prescott in 9 hours, and 32 minutes. Nikrent advanced from sixth position at Needles to third, his elapsed time being 9 hours, 30 minutes. Both Nikrent and Davis arrived at 3:08 p. m.

NEEDLES, CAL., Nov. 9—Barney Oldfield, at the wheel of a Stutz was first at the initial night control in the Los Angeles-Phoenix desert race, completing the 301.4 miles in 8:45:55; R. C. Durant in a Chevrolet was second in 8:51:54; Beaudette in a Paige, was third in 9:14:55; Davis, Simplex, was fourth in 9:19:30; Louis Chevorlet was fifth in 9:24, and Nikrent in a Paige was sixth in 9:25.

Two cars already are out of the race. Pink, in a Thomas, went into the ditch 15 miles out of Los Angeles and the car was driven 100 miles further by mechanician Tom Ely before going out. Sprague at the wheel of a Dietrich also was wrecked but not badly hurt.

On November 10 twelve will start on the second run to Prescott, a distance of 236 miles. The final leg of the race is from Prescott to Phoenix, Ariz., the total distance being 671 miles.

LOS ANGELES, CAL., Nov. 9—Twenty cars were sent away at 5:30 Monday morning, November 9, in the seventh annual Los Angeles-Phoenix road race and for three days their drivers will battle for supremacy over a course 671 miles long, or 132 miles longer than any previous desert race. The starters follow:

DRIVER	CAR	DRIVER	CAR
Beaudette	Paige	Snow	Metz
L. Chevrolet	Chevrolet	Taylor	Alco
Schnack	Ford	Foulke	Metz
Davis	Simplex	Ellis	Buick
Oldfield	Stutz	Sprague	Dietrich
Anderson	Kissel	Burns	Stutz
Carlson	Maxwell	Pink	Thomas
Nikrent	Paige	Bramlett	Cadillac
Wing	Metz	R. C. Durant	Chevrolet
Greenwood	Kincaid Sp.	DuBois	Cole

The course over which this year's race is run is an entirely new one and on the whole better road conditions obtain than was the case last year.

The first part of the race from East Lake Park to San Bernardino is practically all a concrete boulevard and the distance is 61 miles to the first checking station. The first night stop is at Needles, on the banks of the Colorado.

The second night control is at Prescott, Ariz., just 134 miles from the finish line of Phoenix, Ariz. Thence, the road leads by a winding way to an elevation of 7,000 feet and then drops down to Skull Valley, 18 miles out of Prescott. There are two routes from Wickenburg to Hot Springs Junction, the one through Tub Springs being 19 miles in length and the other through the Garden of Allah being 16 miles. Weather conditions will determine which of the two is chosen.

Under almost any weather condition, nearly every variety of roads are to be encountered on the race and though the race is hard enough when the sun shines, the difficulties to be overcome in the event of rain are sufficient to entitle the driver to all the plaudits he wins.

The checking stations together with their distances from the starting point follow; San Bernardino, 61; Victorville, 102; Barstow, 136; Needles, 301.4; Kingman, 368.4; Ash Fork, 479.4; Prescott, 537.4; Wickenburg, 609.4; Phoenix, 671.4.

Pope-Hartford Breaks El Paso-Phoenix Record

PHOENIX, ARIZ., Nov. 9—Beating twenty-eight other starters, and lowering the record for the trip by more than 2 hours, Hugh Miller, at the wheel of a Pope-Hartford, today won the El Paso-Phoenix road race of 533 miles in 14:37. Miller averaged nearly 37 miles an hour. J. T. Hutchins (Buick) was second, in 15:57, and C. W. Tucker (Stutz) was third in 16:40. Miller's performance is all the more praiseworthy because of the fact that his car overturned yesterday near Bisbee. Neither he nor his mechanician were hurt, however.

500-Mile Race Date Is May 29

INDIANAPOLIS, IND., Nov. 7—The Indianapolis motor speedway's 1915 racing campaign will open next week, with the distribution of entry blanks for the next 500-mile race, it is announced today. The date of the race will be Saturday, May 29, Decoration day next year falling on Sunday, and the piston displacement limit will be 300 cubic inches.

Several factories, including Stutz, Maxwell and Mercer, are known to have 300-inch machines already under construction, so that no difficulty in filling the entry list is anticipated. Foreign entrants, of course, will be few, being limited to such drivers as are ineligible for army service or are natives of countries not at war, such as Italy.

Corona Entries to Date Number 11

CORONA, CAL., Nov. 10—Indications are that twenty-five entries will be made for the Corona road race on Thanksgiving. To date eleven entries have been made. These are as follows:

CAR	DRIVER	ENTRANT
Stutz	Klein	W. M. Brown
Stutz	Anderson	W. M. Brown
Stutz	Oldfield	W. M. Brown
Ono		Frank Young
Mercer	Pullen	Pacific Coast Mercer Agency
Mercer		Pacific Coast Mercer Agency
Mercer		Pacific Coast Mercer Agency
Peugeot		Harry Grant
Sunbeam		Harry Grant
Sunbeam		Harry Grant
Mercedes	De Palma	De Palma

Grand Prix Date Changed to Feb. 27

SAN FRANCISCO, CAL., Nov. 9—There will be no 2 weeks' delay between the Vanderbilt Cup and the Grand Prix automobile races that are scheduled as Panama-Pacific International Exposition attractions.

At a meeting of the racing committee of the exposition it was decided to set forward the date of the Grand Prix race to Saturday, February 27, instead of March 6. This will make this international event take place 5 days after the Vanderbilt Cup contest, which is to take place Monday, February 22.

The reason for the change is that many of the racing drivers who have signified their intention of entering the races protested that the time between the original dates was too long and would prevent them from competing in other races about the country. The two automobile classics are expected to attract hundreds of thousands to the course, which is admitted to be one of the best in the country. The best known drivers in America have signified their intention of entering, and the racing committee looks for some very fast time to be made.

Road Race Planned for Oklahoma City

OKLAHOMA CITY, OKLA., Oct. 30—The Southwestern Racing Assn. expects to conduct a road race on Friday, May 1, on a course in the outskirts of Oklahoma City. The course is 9.3 miles in length and the race for thirty laps, or 280 miles. It is to be a free-for-all, and known as the Southwestern Sweepstakes. The prizes are to be as follows: First, $5,000; second, $2,500; third, $1,500; fourth, $750 and fifth, $500.

The course is roughly D-shaped with two legs in the outskirts of the city and the curved part a portion of the boulevard system. It is in the outskirts on the northeast corner of the city. The boulevard section of the course, approximately 5 miles, is 100 feet wide, and in good condition. This road was built by a bond issue and is well maintained. The remainder of the course or the other two legs is on outlying city streets. One leg, known as the south, is a part of the Savannah-Los Angeles cross-country road, and is known as East 23d street in the city. The other leg, known as the west, is a part of the Winnipeg to the Gulf Highway and is about 50 feet wide. There are few houses on these two legs, not more than eight or ten on each.

Overland Stromberg-Equipped Makes 29 M.P.G.

CHICAGO, ILL., Nov. 9—A 1915 Overland Model 80, equipped with a Stromberg carbureter, made a fuel economy and all-around-efficiency test Monday, November 9, in Chi-

cago, under A. A. A. sanction; it went 29 miles on a gallon of gasoline, throttled down to 5 miles an hour and speeded up to 45 miles on high, accelerated to 30 miles from a standing start in 13 3-5 seconds, and climbed Hubbard's Hill from a standing start, finishing at 20 miles an hour. The car with five passengers weighed 3,930 pounds, giving a ton-mileage of 56.84.

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PHILADELPHIA, PA., Nov. 8—The Fletcher Cup Run, postponed from last spring, was conducted today by the Automobile Club of Philadelphia, and G. W. B. Fletcher, driving a Buick, was the winner. R. P. Brown in a Packard was second. Eleven cars finished.

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Los Angeles Section E. V. A. A. Meets

LOS ANGELES, CAL., Nov. 4—The fourth monthly meeting of the Los Angeles section, Electric Vehicle Assn. of America, was held in the banquet room of the Jonathan Club here this evening. Since the organization of the local branch of the electric body, 4 months ago, the Los Angeles branch has grown to be the fourth largest chapter in the association, with a membership of fifty-four. The meeting tonight was preceded by a dinner which was attended by the entire membership. After the banquet a short business session was held, after which papers on the electric vehicle industry were read.

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Radiation Indianapolis S.A.E. Subject

INDIANAPOLIS, IND., Nov. 11—"Radiators and Their Relation to the Motor Car" was the topic discussed at the meeting of the Indiana section of the Society of Automobile Engineers last night. The reasons for overheating of motors and the method of preventing this were taken up. The design of efficient radiators and their construction were also discussed. One of the interesting points brought up was the reason for the V or pointed type of radiator. The paper was given by C. H. Greer, who is chief engineer of the McCord Mfg. Co., Detroit, Mich.

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M. A. D. A. Is Reorganized—New Officers

MILWAUKEE, WIS., Nov. 7—The Milwaukee Automobile Dealers' Assn., which promoted the Vanderbilt Cup and Grand Prix races in Milwaukee in October, 1912, and has promoted the annual Milwaukee motor show since the Milwaukee Automobile Club relinquished the management of the exposition in 1910, has been reorganized with Frank J. Edwards, head of the KisselKar Co. and Edwards Motor Co., Milwaukee, as president. All of the old officers have retired, Isaac G. Hickman, president for the past 3 years, having gone out of the automobile business with the establishment of a direct factory branch in Milwaukee by the Ford.

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DETROIT, MICH., Nov. 6—At a meeting of the creditors of the Benham Mfg. Co., held yesterday, it was suggested that the Union Trust Co., be appointed trustee of the property and that steps be taken for the disposal of the latter. Final action was postponed until November 13, when another meeting will be held.

Truck Makers to Meet at Shows

Both New York and Chicago Will Provide Ample Space—No Exhibits

NEW YORK CITY, Nov. 9—The Board of Directors of the National Automobile Chamber of Commerce is turning its attention more and more to the commercial vehicle industry. Although there is to be no exhibition of trucks this year it was decided at last week's meeting of the board that in the distribution of space at the National Automobile Shows at New York and Chicago, a sort of business bourse will be established with ample facilities for the meeting and transaction of business of the thirty-one members of the Chamber who make commercial vehicles, and their dealers, agents, prospects, users, etc. This will be in the nature of a hotel exchange or lobby. No exhibits will be permitted but every opportunity will be offered to do business.

Reports of shipments during October were very encouraging. The traffic committee of the Chamber stating that during the month of October, 10,225 carload shipments were made, an increase of 2,531 carloads over the corresponding month of 1913.

In attendance at the meeting were: Charles Clifton, Pierce-Arrow; Wilfred C. Leland, Cadillac; C. C. Hanch, Marmon; S. T. Davis, Jr., Locomobile; M. J. Budlong, Packard; W. T. White, White; E. R. Benson, Studebaker; Hugh Chalmers, Chalmers; John N. Willys, Willys-Overland; H. H. Rice, Waverley; H. O. Smith, Premier; W. H. VanDervoort, Moline, and Alfred Reeves, general manager.

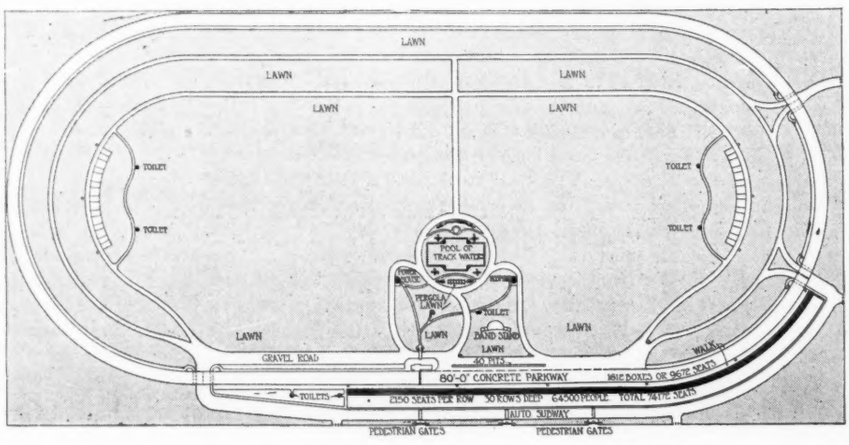
Four Floors for Cars

NEW YORK CITY, Nov. 6—So great has the demand of automobile makers been this season for space at the Fifteenth Annual National Automobile Show in Grand Central Palace, New York, that for the first time four floors of the huge building will be utilized for the display of complete cars. The show is scheduled to open Saturday, January 2, and will continue until January 9. Even with four floors available Manager S. A. Miles and the show committee find that they are unable to accommodate all of the applicants for exhibition space. Heretofore the fourth story of the Palace has been used exclusively for accessory exhibitors, but some of these will be obliged to get along with smaller space than in former years in order to make room for the complete cars.

Already 548 exhibitors are on the list for these two shows, which is an unusually large number and before the doors are open this number will be materially increased. Ninety-two complete car makers are on the list for the New York show and ninety-one for Chicago. Exhibitors are taking over 1,000 square feet more floor space at the New York show this year than last.

Plan of 2-Mile Speedway for Minneapolis and St. Paul

MINNEAPOLIS, MINN., Nov. 7—The new speedway to be built by the Twin-City Speedway Assn., will be a 2-mile platter-shaped track 80 feet wide and having on either side gravel safety zones 32 feet wide. The track will be banked throughout its entire circuit, the banking being 2 per cent. on the straightaways and 35 per cent. on the turns. The radius of the curves will be 2,200 feet. It will be 4.5 miles from the court house in either St. Paul or Minneapolis. It is estimated that the grandstands will seat 76,450 persons and the bleachers an additional 30,000. There will be accommodations within the ground for 100,000 automobiles. The buildings within the oval of the track will be sunk so as not to interfere with the view of people sitting in the parked automobiles around the track.



Holds Headlight Rule Invalid

Milwaukee Judge Decides Ordinance Conflicts with State Automobile Law

MILWAUKEE, WIS., Nov. 9—The city of Milwaukee's earnest effort to curb the dazzling headlight evil has practically been set at naught by a decision of Judge Backus of the municipal court holding the so-called headlight ordinance unconstitutional because it is in contravention to the state motor code.

Early this year the Milwaukee common council asked the Milwaukee Automobile Club to frame an ordinance to prevent the use of brilliant or dazzling headlights within the city limits. This provides that no vehicle may carry a lamp or lamps the main direct rays of which shall strike the roadway more than 200 feet forward from the base of such vehicle on a horizontal roadway. A large number of arrests and convictions resulted. Judge Backus now quotes the state law: "there shall be displayed on the front of every automobile or other similar motor vehicle, while being operated or driven along or upon any public highway of this state, at least one lamp giving a reasonably bright light in the direction in which said automobile or other similar motor vehicle is going * * * and it shall be unlawful for any person to operate or drive any automobile or other similar motor vehicle * * * at such a rate of speed that such vehicle cannot be brought to a complete stop within the distance ahead that the driver or operator thereof can, with the aid of the lights thereon, in connection with the lights from other sources, see an object the size of a person." The state law also provides: "The provisions of this section shall be uniform in operation throughout the state and no city, village, county, town, park board or other local authorities shall have power to enact, pass, enforce or maintain any ordinance, resolution, rule or regulation, requiring local registration or other requirements or in any manner excluding or prohibiting any automobile or other similar motor vehicle, whose owner has complied with the provisions of this section, from the free and unobstructed use of all public highways, driveways and parkways within the state." The Wisconsin Legislature meets again in January, 1915, and in the meantime no efforts will be made to test the decision, as the legislature will take care of the dazzling headlight proposition, according to Milwaukee members.

Municipality Not Liable for Damages

MILWAUKEE, WIS., Nov. 9—A municipality cannot be held liable for damages in personal injury actions based upon accidents caused by motor or other vehicles operated by the fire and police alarm system, according to the opinion and decision of the supreme court of Wisconsin in the case of Engel vs. City of Milwaukee. Engel was injured by being struck by a fire alarm telegraph car and was given damages in the circuit court. The supreme court reverses the decision and upholds the city's contention that the fire and police alarm system is a governmental function. Its apparatus has the same right of way on public thoroughfares as fire apparatus, police patrols, ambulances and United States mail carriers.

Automobilists Win Wheel Tax Test Case

LINCOLN, ILL., Nov. 9—Declaring that a city wheel tax is double taxation and illegal, Judge George W. Patton, of Pontiac, sitting in the Logan county circuit court, set aside the Lincoln city ordinance. His decision held that automobiles, not used for commercial purposes, are exempt from city tax. The law was not questioned in relation to horse-drawn vehicles.

Goodyear Has Made 4,500,000 Tires

AKRON, O., Nov. 9—At the conference in this city, recently, of the Goodyear Tire & Rubber Co., salesmen from all over the country, it was brought out that that company has produced a grand total of 4,500,000 tires in its existence. This company manufactures tire machines in its own plant, which enables it to turn out fifty tires a day per man, compared with an average of five tires a day by hand labor.

Koehler Concentrates on 1-Ton Truck

NEW YORK CITY, Nov. 6—The H. J. Koehler Co. has discontinued selling pleasure cars, having decided to concentrate its efforts in the marketing of the Koehler 1-ton truck built at the Newark, N. J. factory. The truck output should be almost doubled during 1915.

NEW YORK CITY, Nov. 9—Paul Lacroix, Mercedes distributor for the United States, has taken the agency for the Imperial car. His territory includes this city, Long Island, northern New Jersey, southern part of New York State and part of Connecticut, with export rights. The new Imperial agency headquarters will be at the Lacroix showrooms, 3 East 52d street, with a service department at the Mercedes shops, 218 East 54th street.

Stewart Feed Shows 3.4 Miles Gain in Test

DETROIT, MICH., Nov. 7—The Stewart vacuum feed on an Oakland is better than a pressure feed by 3.4 miles to the gallon of fuel, according to an unofficial test made November 9, between Detroit and Ypsilanti, Mich., with a 1915 Oakland Model 37 roadster. On the run toward Ypsilanti, with pressure feed, the car made 25.3 miles on 1 gallon; on the return, with Stewart feed, it made 28.7 miles on 1 gallon. The car and load weighed 2,763 pounds; it was equipped with a Marvel carbureter and Goodyear non-skids

Dodge Is Streamline Touring Car Selling at $785

(*Continued from page* 883)

vanadium steel and the shafts run on ample ball bearings.

Following the drive back from the gearset, it next goes through a universal of the ring-and-yoke type which is completely inclosed. The propeller shaft is tubular and is inclosed within a torsion tube which takes drive and torque, and which is riveted to the front of the rear axle housing.

The floating rear axle has a pressed steel housing with large plate at the rear giving access to differential and bearings. The differential is carried on the removable front cover portion of the housing. The steel stock used is 3-16 inch thick and the gears are vanadium steel heat treated. Timken bearings are used throughout the axle assembly and in rear wheels. The axle gear ratio is 3.615 to 1.

Mounted on the front cover portion of the housing are the brake shafts and equalizers, allowing the operating rods to run forward to the controls about centrally of the frame. The service brakes contract on the 12-inch rear wheel drums, while the emergency set expand internally. The drum width is 2 1-4 inches.

Chrome vanadium steel self-lubricating springs support the frame, the front set being half-elliptic and the rear three-quarter. They are overslung on the axles. The spring dimensions are: Front, 35 13-16 inches long by 1 3-4 inch wide; rear, 43 inches long by 2 inches wide.

The frame is well-braced with three cross members, and is pressed from 5-32 inch stock into channel section 3 1-2 inches deep. There is a kick-up at the rear to clear the axle, and the front bottle necks, allowing the car to turn in a 40-foot circle.

The steering gear is of the irreversible nut-and-sector type controlled by a 17-inch wheel. The spark and throttle control levers are placed on a sector under the steering wheel.

The round 15-gallon gasoline tank is hung at the rear by forged brackets and the feed to the carbureter is by air pressure maintained by a camshaft pump. The instrument board carries a hand pump for auxiliary air pressure on the fuel in this tank.

Tread is standard 56-inch with the option of 60-inch.

Factory Miscellany

FORD Adds Canadian Plant—By the opening on November 2 of a large and modern assembling and repairing plant at Laurier and DeGaspe avenues, Montreal, Que., the Ford Motor Co. of Canada will have brought the total number of its large branches of this kind in the Dominion to eleven and employment will be given in the plant to about 200 men, most of whom will be Montrealers, though a few more of the expert mechanics will be brought from Ford, Ont., where the Canadian company has its factories and headquarters. The new plant, which faces on Laurier avenue, has been erected at a cost of $300,000 and covers an area of 160 by 150 feet. While the building is at present but four stories in height, it has been so solidly constructed that it will be possible to add six more floors, the structure having been designed with this end in view. A novel feature of the plant is a flat concrete roof surrounded by a parapet for testing the cars after they have been assembled or repaired. The two big freight elevators run up as far as the roof through a tower erected at one corner so as to admit of the automobiles being brought up. Access by rail to the plant has been attained by the building of a spur from the C. P. R., and special facilities have been provided for unloading, dumping coal, etc.

Williams Tire Purchases Land—The Williams Tire Co., Vista, Pa., has purchased 10 acres of land upon which it will erect a plant.

May Start Plug Plant in Rockford—Arthur Bergstrom, inventor of the Bergie national spark plug, may start a manufacturing plant in Rockford, Ill.

New Plants for Aluminum Goods—The Aluminum Goods Co., Two Rivers, Wis., has taken occupancy of two new brick factory buildings erected during the past summer and will increase its capacity from 40 to 60 per cent.

Hartford Rubber Works Resume—The Hartford Rubber Works, Hartford, Conn., which has been running with a small force since the outbreak of the war, resumed, in part, recently. The entire plant is expected to be running full force soon.

Special Machinery for Abbott Ball—The Abbott Ball Co., Hartford, Conn., has perfected special machinery whereby it is able to turn out balls of all sizes, from ⅛ inch to ½ inch in diameter, and will later be in a position to furnish all other sizes.

Kelly Truck's New Additions—The Kelly Motor Truck Co., Springfield, O., has awarded contracts for the erection of two large additions to its plant. The additions are necessary because of the rapid increase in the business of the concern. One of the additions will be 260 by 50 feet and the other 100 by 60 feet.

Golden West's New Factory—The Golden West Motors Co., Sacramento, Cal., has erected and equipped a factory 150 by 300 feet and a pattern shop for the manufacture of motor trucks. It will begin the construction of a third building, and is figuring on buying a number of automatic high-speed machinery shortly.

Wayne Tank Working Full Force—That the Wayne Oil Tank Co., Fort Wayne, Ind., has the best of an outlook for the future was the statement of several of the factory officials given out recently. The boiler department and the shipping department are both working their full force 10 hours a day. All of the other departments are working their full force 8 hours per day.

Blodgett Plant Ready for Work—Within a short time the Blodgett Rubber Co., St. Joseph, Mich., will have its plant in full running order. For several weeks the machines to be used in the manufacture of the new process inner tubes for automobiles have been arriving in St. Joseph for installation in the plant. The old plant of the Blodgett company in Warren, O., has been removed to St. Joseph.

J. I. C. Builds Garage—The J. I. Case T. M. Co., Racine, Wis., is building a large garage at its administration building for the exclusive use of the officers and employees of the company. Up to this time officers and employees have been obliged to leave their cars in streets and alleys near the large office building, which is some distance from the main works, throughout the day, winter and summer.

Chevrolet May Add New Plant—Property covering about five city blocks, surrounding the plant of the Chevrolet Motor Co., Flint, Mich., has been purchased by President W. C. Durant, of that company. It is rumored that this purchase was made with the intention of adding a new plant, which is to have more than double the floor space of the present plant, and which will permit in time an annual output of 20,000 cars.

Paint Shop for Maxwell Plant—The Maxwell Motor Co., Detroit, Mich., is enlarging its factory space to make room for the increase in material and manufacturing. A circus tent was set up on the Maxwell factory grounds in Detroit as a temporary paint shop, where only axle housings were painted. The tent is soon to be taken down, however, for beside it has been constructed a mammoth building to be used for painting and enameling work only. The building is 300 feet long and 150 feet wide. It is modern in every way, having steel construction throughout, cement bases and floor, with walls of yellow brick.

The Automobile Calendar

Nov. 9-14.....Atlanta, Ga., Fourth American Road Congress.
Nov. 12.....Phoenix, Ariz., Track Race, Maricopa Auto Club.
Nov. 14-21.....Providence, R. I., Show, State Armory, P. S. Clark, Mgr.
Nov. 16-21.....Spokane, Wash., Show, Spokane Chamber of Commerce and the National Apple Show, Inc., G. C. Corbaley, Secretary.
Nov. 17-18-19....Harrisburg, Pa., Second Conference of Pa. Industrial Welfare and Efficiency, State Capitol.
Nov. 26.....Corona, Cal., Road Race, Corona Auto Assn.
Dec. 1-4.....New York City, Annual Meeting of the American Society of Mechanical Engineers.
Dec. 12-19.....Akron, O., Show, Akron Auto Show Co., O'Neill Bldg.
Dec. 14-18.....Chicago, Ill., American Good Roads Congress.
Jan. 2-9.....New York City, Annual Automobile Show, Grand Central Palace.
Jan. 3-10.....Buenos-Aires, Argentina, Grand Prize of Argentina.
Jan. 9-16.....Philadelphia Show, Metropolitan Bldg., Philadelphia Auto. Trade Assn.
Jan. 11-16.....Buffalo, N. Y., Show, Broadway Auditorium, Automobile Club of America.
Jan. 16.....Detroit, Mich., Show
Jan.16-23.....Cleveland, O., Show, Cleveland Automobile Show Co., F. H. Caley, Mgr.
Jan. 23-30.....Chicago, Ill., Automobile Show, First Regiment Armory.
Jan. 23-30.....Montreal, Que., Show, Allen Line Liverpool Bldgs., Montreal Automobile Trade Assn., T. C. Kirby, Mgr.
Jan. 30-Feb. 6....Minneapolis, Minn., Show, National Guard Armory, Minneapolis Automobile Trade Assn.
Feb.....Portland, Ore., Show, Portland Auto. Trade Assn.
Feb.....Toledo, O., Show, Toledo Auto Show Co.
Feb. 15-20.....Omaha, Neb., Show, Auditorium, C. G. Powell.
Feb. 22.....San Francisco, Cal., Vanderbilt Cup Race, Panama-Pacific Exposition Grounds; Promoter, Panama-Pacific Exposition Co.
Feb. 23-27.....Syracuse, N. Y., Show, Syracuse Auto. Dealers' Assn.; H. T. Gardner, Mgr.
Feb. 27.....San Francisco, Cal., Panama-Pacific Exposition, Grand Prize Race, Panama-Pacific Exposition Grounds; Promoter, Panama-Pacific Exposition Co.
Mar. 6-13.....Boston, Mass., Show, Mechanics Bldg., Boston Auto Dealers Assn., Boston Commercial Motor Veh. Assn.
Mar. 9-15.....Des Moines, Ia., Show, C. G. Van Vliet.
Mar. 14.....San Francisco, Cal., Panama-Pacific Cup Race, Panama-Pacific Exposition Grounds; Promoter, Panama-Pacific Exposition Co.
April.....Calumet, Mich., Show, Coliseum.
May 29.....Indianapolis, Ind., 500-Mile Race, Indianapolis Motor Speedway.

The Week in the Industry

Motor Men in New Roles

RACING Drivers Retire—"Johnny" Minker, formerly of York, Pa., but for the past 2 years a resident of Richmond, Va., was in York recently and stated that he had decided to give up the automobile racing game. Minker for a number of years has been a well-known driver of racing cars, being connected with the Kline Motor Car Corp. He has resigned that position and opened a garage and service station at Littlestown, Pa., with L. E. Alleman as a partner. George Benedict, well known in automobile racing circles as mechanician for Burman, Teddy Tetzlaff and other racing stars, has retired from the sport. It is a strange coincidence that his former companion, Tetzlaff, has also said farewell to the hazardous pastime.

Paterson Pres. Carriage Assn.—W. A. Paterson, the automobile and carriage builder, has been appointed a vice-president of the Carriage Builders' National Assn., Flint, Mich.

Grant Goes West—Harry Grant, the well-known driver, left Boston recently for the Pacific Coast, where he will drive the Sunbeam in all the big races held in California during the winter.

Fuller Gets Elected—Alvan T. Fuller, who has the Packard agency for Boston, Portland and Providence, was elected a member of the Legislature from Malden, Mass., last week on the Bull Moose ticket.

Paint Expert Promoted — William Rauschenberger, paint and varnish expert of the Studebaker Corp. plants in Detroit, Mich., has been assigned charge of similar operations in the company's South Bend works as well.

Simonds Leaves Maguire — Frank Simonds, for several years in charge of the service station of the J. W. Maguire Co., Boston, eastern Massachusetts agent for Pierce-Arrow cars, resigned last week to go into business for himself in Brookline, Mass.

Graves Cartercar Chief Engineer—H. S. Graves has been made chief engineer of the Cartercar Co., Pontiac, Mich. He has been associated with the company for the past 2 years. Prior to that time he was connected with the E. R. Thomas Motor Co., the Buffalo Gasoline Engine Co. and the Studebaker and Maxwell companies.

Campion Resigns; Joins Marathon—Ed L. Campion, for 13 years a member of the Firestone Tire & Rubber Co. sales organization, has resigned as manager of the Seattle, Wash., branch to accept the position of sales manager of the Marathon Tire & Rubber Co., the offices of which are at Cuyahoga Falls, O. Campion's successor has not yet been named.

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Garage and Dealers' Field

Pillaging Automobiles in Mexican City—The private garages of hundreds of wealthy refugees and other residents of the City of Mexico, Mexico, have been pillaged of automobiles during the last several weeks. Many cars were also confiscated by army officers and Federal employees.

King Agency's New Sales Plan—The King Motor Car Sales Co., Detroit, Mich. distributors for the King cars in the state of Michigan, has recently started selling on time payments. Under the present general conditions it has been deemed advisable to extend time to customers of good standing and thus from 30 to 90-day notes are accepted.

Planning Many Service Stations—In anticipation of a tremendous volume of tourist travel north and south along the Pacific Coast, automobile branches and distributing agencies are laying plans for the operation of a chain of service stations from the Canadian border to the Mexican boundary. Motor touring over the Pacific Highway and the routes from the country east of the Coast range is expected to break all records. The expositions at San Francisco and San Diego, the opening of new highways and the closing of European countries to tourists will combine, it is predicted, to send thousands of automobiling enthusiasts to the Western Slope in 1915.

Auction Co. in Boston—The Boston Auto Sales and Auction Co. has been formed in Boston with J. R. McPherson as president and J. M. Barry as treasurer, and a large building at the corner of Brighton and Commonwealth avenues has been leased, where every Tuesday morning at 11 o'clock automobiles will be sold at public auction. It is the first time that a company has been formed exclusively for this purpose in Boston. All cars will be sold subject to a return in 48 hours if the machines are not as represented by the owners' guarantee. Every owner turning in a car will have to give a written guarantee as to the condition of the car, and the company will have men examine it to see if this is true.

Peerless Establishes Agencies—The Peerless Motor Car Cos., Philadelphia, Pa., and Boston, Mass., have decided to discontinue their branches and hereafter will be handled as agency propositions. In Boston this new plan will mean the discontinuance also of the Rauch & Lang Electric Co.'s branch. The electric company has taken charge of the office there and has sent on its own men from Cleveland to handle the product as a branch. The Beacon Motor Car Co. has been organized to handle the Peerless in Boston, while the Girard Automobile Co. will handle it in Philadelphia at 2314 Chestnut street, in charge of R. W. Cook. The Peerless and the Rauch & Lang will occupy the same building in Boston at 660 Beacon street. J. L. Snow, manager of the branch, will continue at the head of the Beacon Motor Car Co. Sub-agencies will be established throughout New England for the Peerless line.

Motor Bus Lines Thrive in Wash.—The effect of motor bus lines operating in competition with electric interurban systems is shown in a special report filed with the Public Service Commission of the State of Washington by the Puget Sound Electric Co., covering its line between Seattle and Tacoma, a distance of approximately 40 miles. The report shows that the local passenger business dropped from 226.471, handled in August, 1913, to 99,484 during August, 1914, a loss of approximately 125,000. The through passenger business remained about the same. A big fleet of motor trucks of both passenger and freight carrying types is operated from Seattle to the valley points, and it is so liberally patronized that the electric interurbans are losing business. Last June the traction corporation increased its rates between local points, and then sprang up motor bus lines. The result has been that a loss of more than $8,000 in passenger fares in August alone was suffered.

Automobile Agencies Recently Established

PASSENGER CARS

Arizona

Tucson	Oldsmobile	Shad. Bowyer

Arkansas

Gillette	Glide	H. D. Dilday
Little Rock	Chandler	Butler Auto Co.

California

San Francisco	Chandler	Peacock Motor Sales Co.
San Francisco	King	Reliance Auto. Co.

Canada

London, Ont	Chandler	Hendricks Garage

Colorado

Denver	Chandler	A. T. Wilson Auto Co.
Glenwood Springs	Oldsmobile	Dr. G. A. Hopkins
Salida	Oldsmobile	Salida Auto Co.

Connecticut

Danbury	King	A. C. Penny

Delaware

Wilmington	Oldsmobile	Harry R. Loose

Florida

Eustis	Chandler	Harry S. Jones
Miami	Regal	C. Benton Dean

Georgia

Atlanta	Chandler	John M. Smith

Illinois

Chicago	Regal	G. E. Holmes
Toulon	Glide	F. E. Cole
Warrensburg	Glide	W. W. Albert

Indiana

Auburn	Hercules	Charles Kinsey
Evansville	Chandler	Leo. A. Reitz
Evansville	Mitchell	Vanderburg Auto Co.
Indianapolis	Regal	Peterson-Keyes Auto Co.

Iowa

Baxter	Cole	Hager Bros.
Creston	Cole	L. M. Butts
Dayton	Cole	Carl Johnston
Grand Junction	Cole	E. A. Caswell
Nevada	Chandler	Knudson Auto Co.
Sioux City	Cole	Cole Motor Co.
Waterloo	Regal	Peverill Motor Sales Co.

Kentucky

Louisville	Overland	Overland-Louisville Co.

Accessories for the Automobilist

RED Head Spark Plugs—Two new Red Head spark plugs, Figs. 1 and 2, have been announced by the Emil Grossman Mfg. Co., Bush Terminal, Brooklyn, N. Y. One is designed for modern operating conditions caused by higher speed, higher compression motors. One hundred dollars has been offered as a prize for a suitable name for this plug. The porcelain is a high insulating body of substantial size. Cement is poured into the space between the porcelain and the internal threads of the shell, and the entire plug is then baked by a secret process. No bushings or gaskets are used. The terminal screw is sunk and baked into the porcelain; it cannot be twisted off when pliers are used to tighten the terminal. The sparking points are heat-resisting nickel steel and will not burn away, it is stated. The shell electrode is formed to keep oil away from the sparking points. This plug is made in all sizes and sells for 75 cents.

The other new plug is a priming plug for Ford cars. A plug of this type is of especial service in Winter when the motor requires priming to facilitate starting. The porcelain is straight-sided and will not crack. It is held in place by a large steel bushing which gives ample gripping surface for any wrench. The long body shell overcomes the depression in the cylinder head, the large priming cup allows a free flow of the gasoline, and the heavy meteor wire firing points prevent burning away of the firing points. The price with either porcelain or mica electrode is $1.25.

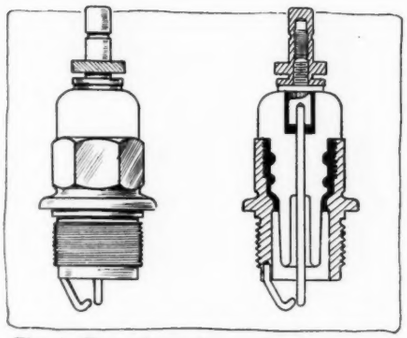

Fig. 1—Two views of new Red Head spark plug for which $100 has been offered for a suitable name

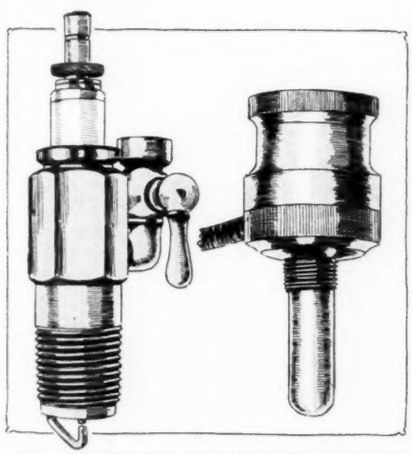

Fig. 2—Left—New Red Head Ford priming plug. Fig. 3—Right—Andersen storage battery regulator

Braender Non-Skid—The Braender Rubber & Tire Co., Rutherford, N. J., has put upon the market a new and improved non-skid tire.

The new tread, as shown in Fig. 4, is of the combined raised and depressed type. It retains all the advantages of the original Braender Bull Dog Non-Skid with the well-known fishtail cross bars, but has in addition six heavy webs of rubber so placed between the cross bar projections as to give considerably more rubber on the tire, with more tread surface to take the wear.

Fig. 4—Braender Bull Dog non-skid tire

The addition of the webs overcomes any tendency to side skidding on muddy roads or slippery pavements, it is said, and in combination with the cross bars insures a continuous and smooth riding surface, effectually preventing the wear that rounds the edges of ordinary projections while still retaining all the advantages of an efficient non-skid.

The webs, moreover, are so placed as to relieve the strain heretofore borne by the cross bars alone, while strengthening them and distributing the wear evenly over the entire surface of the tread.

Each depression between the bars and webs has a vacuum grip on the road, formed and released by the rolling tire without waste of power or injury to the road.

Anderson Regulator—To prevent the injury of the battery by overheating while charging the Economy Electric Co., Economy, Pa., has brought out a temperature regulator, Fig. 3, which reduces the charging rate as the temperature rises above 100 degrees Fahrenheit. The reduction is in proportion to the rise in temperature. Temperatures much above 100 degrees are harmful to a battery and by the use of this instrument this danger is safeguarded. The device, which is known as the Anderson regulator, is guaranteed for 1 year and sells for $3.50. It is simply installed by removing the vent plug. The wiring diagram is shown in Fig. 5.

1915 Mayo Pumps—Two new pumps have been announced by the Mayo Mfg. Co., 60 East 18th street, Chicago, Ill. One is a spark plug pump for Ford cars, Fig. 7, and the other is an impulse pump which is permanently attached to a valve cap, Fig. 6. These pumps will be ready for delivery on Jan. 2. The former is a diminutive spark plug pump built especially for the Ford car and sells for $8 complete. The latter lists at $15.

The Mayo Valve Cap pump requires no fitting other than the drilling and tapping of a 1 3-8-inch hole in one of the valve caps, the screws having 24 threads to the inch. The pump attachment is then screwed into place and the job is completed. It is stated that any machinist

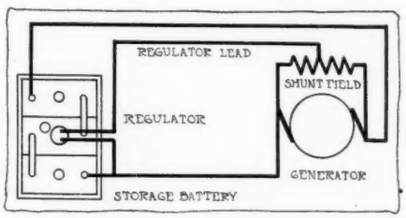

Fig. 5—Wiring diagram, showing installation of Andersen regulator

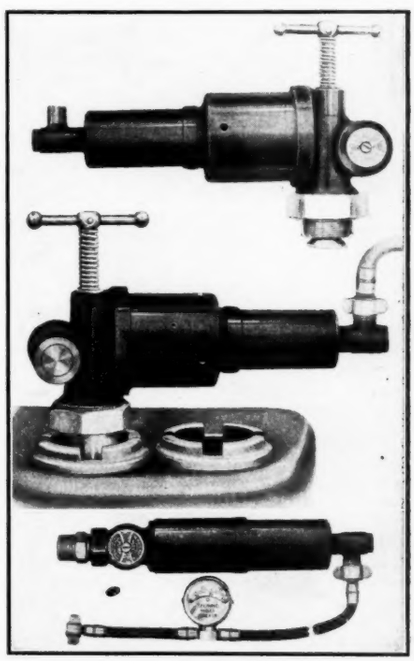

Fig. 6—Two upper views—Mayo valve cap pump, which is designed to be permanently attached

Fig. 7—Lower—Ford spark plug pump

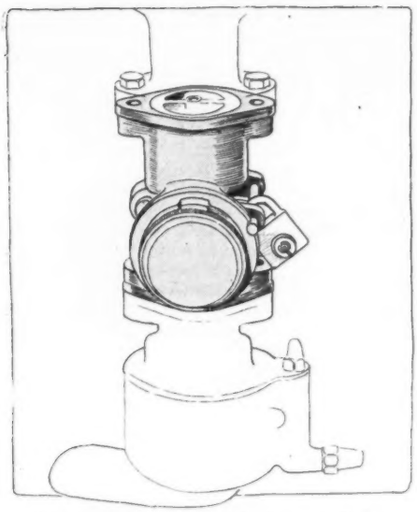

Fig. 8—Kramer self-contained engine governor, which is placed between the carbureter and the intake pipe

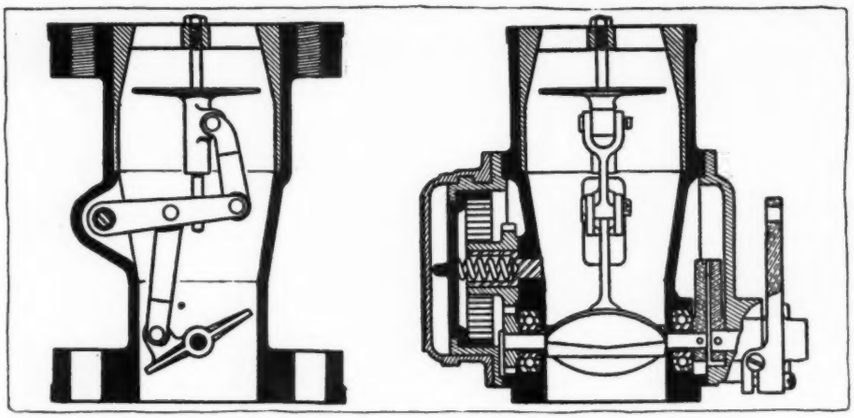

Fig. 9—Sections through Kramer engine governor showing operating disk which is raised or lowered according to the speed of the incoming gases, thus opening or closing the butterfly valve below

can do the work in 1 hour. To operate the pump the handle at the top is depressed and given a quarter turn while the motor is running. This opens the poppet valve shown at the bottom and allows the pump to operate.

A gauge is installed in the hose to indicate the pressure during inflation. A 34 by 4-inch tire can be inflated to 75 pounds pressure in 3 minutes. The maximum pressure obtainable is 150 pounds. The hose may be removed after the tire is inflated, and stored in the tool box.

The Ford pump will inflate a 32 by 3 tire to 65 pounds pressure in 2 minutes and a 32 by 3.5-inch tire to 70 pounds pressure in 3 minutes.

This pump is attached by removing any convenient spark plug, the pump being screwed into its place but not tightened with a wrench. It is furnished with 10 feet of hose and an accurate gauge.

Guide No-Glare Mazda—To eliminate the headlight glare the Guide Motor Lamp Mfg. Co., Cleveland, O., has put on the market a new type of lamp in which the desired end is attained by a special treatment of the upper half of the bulb so that glaring rays from this part are eliminated, the rays being reflected downward and softened. The price of the regular 6-volt, 16-candlepower type is $1.60 per pair. The same price is charged for 6-volt, 12-candlepower Ford lights, and for electric-vehicle work 90-volt lamps of 16 candlepower are furnished for $2.40 per pair. Other candlepowers and voltages may be had on order.

Percama Top Cleaner—A liquid cleaner for mohair tops, seat covers, and similar parts, has just been brought out by the Perkins-Campbell Co., Cincinnati, Ohio, under the name of Percama. It is claimed that substance will remove grease and oil as well as all dirt from seat covers, tops, etc., and will not cause fading of the material. It is sold in quart cans at 25 cents and also in half-gallon and gallon containers.

J. & B. Bulb Carrier—A carrier for extra lighting bulbs is being manufactured by the J. & B. Mfg. Co., Pittsfield, Mass., under the name of the J. & B. It is in the form of a cylindrical cardboard box with a screwed-on cover at each end, the extra bulbs being carried in the covers. The under side of each cover is fitted with a bayonet base, for holding the bulb. The carrier is 5 1-4 inches long and sells for 25 cents.

Bowser Safety Book—A book entitled, Bowser First—Safety Always, has been issued by S. A. Bowser & Co., Fort Wayne, Ind., dealing with the question of safe gasoline storage. Tests of Bowser outfits under various conditions are described and illustrated and accounts of garage fires where these outfits have not been affected by the flames or heat are given.

One test showed the impossibility of exploding the gasoline in a storage tank. A fire was built directly under the tank and kept burning for a considerable length of time. All the gasoline evaporated from the tank but no explosion resulted. In another test the increase in pressure when subjected to heat was determined. A fire was built under a tank full of fuel and the pressure read from time to time. The highest pressure registered was 11.5 pounds, due to the fact that the tank is fitted with an air vent protector which relieves the pressure and acts as a safety valve.

Anti-Freezing Compounds

Horsey Anti-Freeze Solution — The anti-freezing solution made by the Horsey Mfg. Co., 6104 Euclid avenue, Cleveland, O., will not freeze in any climate, it is stated. It will last all season, and in addition to cooling the motor prevents rust and corrosion and lubricates the pump, it is claimed. The color is green in order that a leak may be easily detected. One gallon of the liquid is added to 2 of water. The price is $1 a gallon.

Thermite — The solution known as Thermite, manufactured by the Northwestern Chemical Co., Marietta, O., is guaranteed to remain liquid at 70 degrees below zero when used undiluted. However, under ordinary circumstances it is not necessary to provide for a temperature as low as this, and therefore water may be added, the amount depending on the freezing point desired. A curve, Fig. 10 has been plotted, showing the amount of water to add to give any freezing point between 32 degrees above zero and 70 degrees below. Thus it is a simple matter to make a solution which will meet local climatic conditions. It is stated that Thermite is non-evaporating and that therefore one application is sufficient for all Winter and that it will not injure the cooling system in any way. It sells for $1.25 per gallon.

Jewel Non-Freezing Solution — Denatured alcohol and refined glycerine are the materials used in the solution made by the Wadsworth-Howland Co., Chicago, Ill. This solution is known as the Jewel and is put up in 1 and 5 gallon cans. Water is added to the clear solution, the amount depending on the freezing point desired. For temperatures to 10 degrees above zero 1 quart of the solution is used in 1 gallon of water; to 5 degrees below zero 1.5 quarts to 1 gallon of water; for 20 degrees below zero, 2.5 quarts of solution to 1 gallon; to 34 degrees below zero 1 gallon of solution to 1 gallon of water.

Frezenot—A radiator liquid that will not freeze until a temperature of 54 degrees below zero is reached is made by the Rub-On Mfg. Co., 87 Brayton street, Buffalo, N. Y., under the name of Frezenot. It is sold ready mixed. A barrel costs 50 cents per gallon, and sealed 3 and 5 gallon cans retail at 60 cents per gallon. Only one filling is required all Winter, and it is stated that the liquid will not harm the hose or corrode the metal parts of the cooling system.

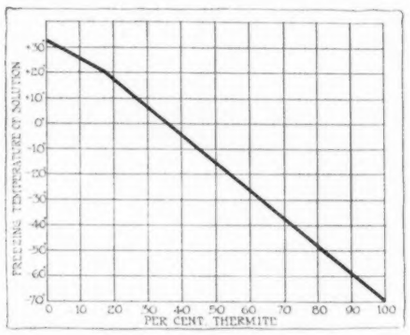

Fig. 10—Curve showing relation between freezing point and amount of water added to Thermite